

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE.

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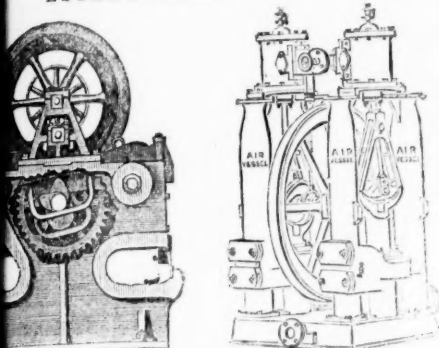
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30.—VOL. XLVI

LONDON, SATURDAY, JUNE 17, 1876.

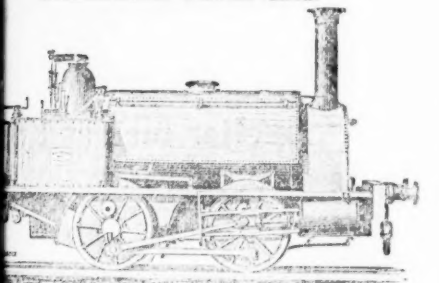
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PARIS,  
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ORDER OF THE CROWN OF PRUSSIA.



PALMOUTH,  
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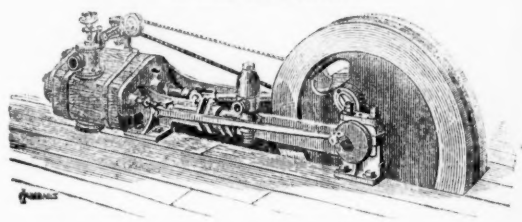
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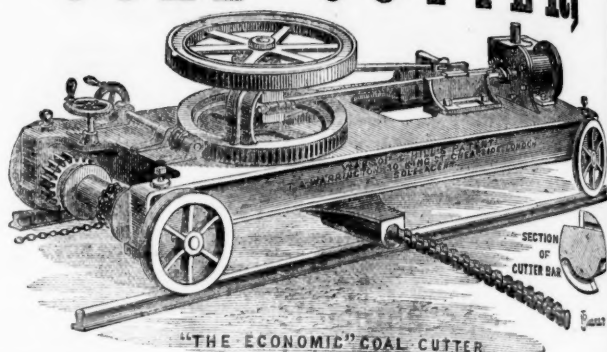
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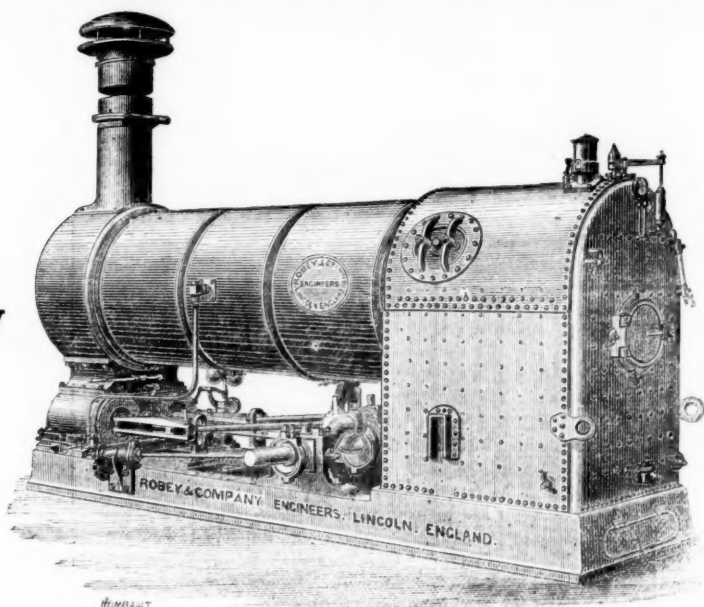
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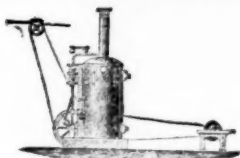


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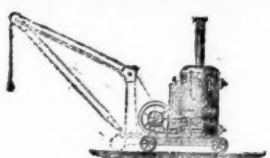
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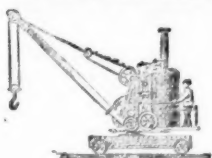
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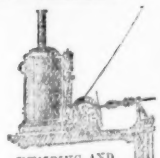
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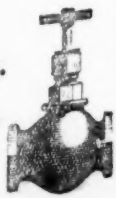
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PRICES AND PARTICULARS ON APPLICATION.





## Original Correspondence.

## THE SULPHUR MINES OF ITALY.

Among the recently-issued Parliamentary Papers is a report, by Mr. Colnaghi, Her Majesty's Consul at Florence, on the Sulphur Mines of the Province of Forlì, from which we condense the following information, as it can hardly fail to be of interest to a large circle of our readers.

The sulphur deposits of the Romagna, which are of miocene lacustrine formation, are situated amid the sub-Apennine hills, and the mines now being worked in the province of Forlì are spread over a superficial area of 260 square kilometres. The outcrop of the rocks of sulphate of lime (gypsum), and those of carbonate of lime, resting on grey clays or marls, denote the presence of the sulphur, which is covered with 10 or 12 strata of clays, intercalated with gypsum under various aspects, wherever the water-courses have not in part destroyed them. The total thickness of these strata to which the sulphur ore conforms, is from 35 to 70 metres. The direction of the sulphur beds is generally towards the north-west, oscillating of the sulphur beds is 22° N.W., except at Perticara-Marazzana, where between 22° and 58° N.W. (70° N.E.). Here the mineral forms a lode, the strata lie E.N.E. (70° N.E.). Here the mineral forms a lode, while at Predappio it is a mixture with limestone, gypsum, and marl. From a document existing in the archives of Ravenna, in which a Dario Tiburti in the fifteenth, and of Polenzo in the sixteenth century, and George Bauer, or Agricola, in his work on Mineralogy, published in 1546, speaks twice of the sulphur of Cesena, and praises its quality.

A law of the Pontifical Government of 1510 declared all mines to be State property, and Paul III., acting under it, annulled by brief of 1535 the privilege granted by his predecessor, Clement VII., to the Valoris of excavating sulphur in the territory of Cesena. He transferred the privilege to the inhabitants of that city and district, giving them the right of preparing the mineral, and of freely selling the produce, save to infidels. This gave rise to the idea that the owners of land were entitled to work any mines that might exist under their property, an interpretation refuted by the Pontifical letters of Gregory XIII., in 1580, by which the rights and dues belonging to the State were recalled to vigour, and their imprescriptibility established. The brief of Paul III., of 1535, was still in force when the province of Forlì was annexed to the kingdom of Italy, and has never been formally abolished. In 1865 a royal decree was published regulating the position of owners or workers of mines in the province with reference to the Government, embodying the principles of the Sarlinian law on mines of 1859, which are inserted in each concession granted.

From 1865 to 1870 the industry of which Consul Colnaghi treats, does not appear to have progressed very favourably, and even the Società delle Miniere Zolferee di Romagna, of which from 1855 to 1861 the profits had varied from 5 to 21 per cent., the average for the 10 years being 12.69 per cent., was not able in 1872 to pay the modest dividend of 3 per cent. without trenching upon its sinking fund. The company, with its fine mines has, however, always maintained its production. A great drawback to the prosperity of many of the mines was the absence of a complete network of good roads. In 1855 three of the mines only were easy of access for carts; but since then considerable advance has taken place, and branch roads, where required have been made at the expense of the companies interested. In 1872 the principal mines belonging to the Società delle Miniere Zolferee Cesenate, were purchased by an English company (limited), with a nominal capital of 350,000*l.* sterling, and a new era of activity commenced for the sulphur region of the district in question.

The chain of the Apennines of the province of Forlì, Pesaro, and Urbino offers a large field for the growth of this industry. The total quantity of refined sulphur produced in 1874 amounted to about 24,700 tons. The profit per ton of refined sulphur is said to be from 2*l.* to 2*l.* 10*s.* The sulphur of Romagna is worth from 15 to 20 per cent. more than that of Sicily, on account of its intrinsic good quality and the degree of purity to which the refineries have brought it. The largest part of the production is used for sulphuring vines, and is readily consumed in Italy. In 1874 about 2134 tons of Romagna sulphur was exported from the district of Ancona to France, Turkey, and Austria, and a certain quantity appears also to have been sent overland to the ports of Leghorn and Genoa for shipment. Consul Colnaghi, however, believes that there is very little, if any, exportation to this country. Foreign trade is as yet little acquainted with the value of the Romagna sulphur, the production of which has not long been brought to its present development. The facility of shipment of Sicilian sulphur naturally attracts trade to the South; but as soon as the position of the Romagna mines is bettered in that respect, there is little doubt that the sulphur trade in connection with them will be enormously expanded.

We cannot follow Consul Colnaghi through all the particulars which he gives respecting various mines; but we will devote a brief space to his remarks on the Cesena Sulphur Company, which, under the able management of Mr. F. Kossuth, C.E., managing director, appears to be advancing steadily on the path of prosperity. On account of the large works for developing the mines many hands are required, and about 1000 men, exclusive of carters, are employed. The men are maintained in excellent discipline by the combined means of regular payment and kind, but firm, treatment. The only foreigners at the mines are the managing director and one English mining engineer, all the miners being Italians, and most of them natives of the district. The men work in gangs, three to 24 hours. Each miner is required to bore three holes in six hours, which being done the whole gang fire their mines together—an operation attended with great difficulty from the dense sulphur smoke developed, which renders respiration barely possible. The mineral is cleared away by the gangs of carriers and wheelers, and carried over tramways which extend to the headings. Each miner is paid the equivalent of about 1*l.* 3*d.* per tramload of 700 kilogrammes (1 kilogramme equal to 2.2046*lb.* avoirdupois), and his earnings are estimated at one place to be from about 3*s.* to 3*s.* 9*d.* per diem; to make the latter sum, however, the gangs have to unite and work extra time. When stone only is found and no mineral an allowance is made, to enable the men to live while working. The firemen are paid per ton on the production of the kilns, and their average earnings are about 2*s.* 6*d.* per diem, those of the carters being 1*s.* 8*d.* to 2*s.* 1*d.* per diem. The men live chiefly on bread, cheese, and vegetables, eating meat on Sundays. They spend much on dress, and on holidays look like well-to-do people; they drink wine freely, but no spirits. They are more persevering at work than English workmen in cases of urgency, and many of them have remained underground for 24 consecutive hours when required. They are very obstinate in using their own tools and in working in their own way, and are accustomed to emphasise each stroke of the borer with their voice. These miners of the Romagna are quarrelsome among themselves, and are convinced that the spirits of those who have lost their lives through accidents in the mine hover about the works underground. The company have a store at the mine for the convenience of the men; but this *botellino*, or Tommy-shop, is on a better system than it was under the old management before the days of the English company. The wages are all paid in money, and the men are free to spend their earnings where they choose. A mutual relief fund has been established to assist the sick and wounded and the widows and children of the men who may be killed. The company grants cent. on the men's earnings for the emergencies of each case; but levies 2 per cent. towards the maintenance of the support of the fund, as well as the maintenance of the doctor, infirmary, &c.

The Società delle Miniere Zolferee di Romagna was established in 1865. In 1872 this company's mines produced 58,412 tons of mineral, which yielded 7873 tons of black sulphur. In 1871 the mineral produced was 58,108 tons, and the yield in black sulphur 8278 tons—

the difference in product between the two years being caused by a falling off in the quality of the mineral extracted. Among the company's mines those at Marazzana and Perticara are the most extensive; the latter, indeed, is one of the most celebrated and important sulphur mines in Italy. Mineral in lenticular masses averages 15 per cent. of sulphur. In the midst of the gypsum, the lower regular stratum, 2 metres thick, averages 12 per cent. of sulphur.

Works in 1874:—Galleries, &c., 5800 metres; facings, 240 square metres; depth, 242 metres. The interior works are conducted by a system of galleries, supported by pilasters, and they communicate internally with the Marazzana Mine. The Perticara Mine has been worked for 150 years, and the works being deep and water present, the cost of extraction is heavy; compensation, however, is found in the excellent quality of the produce. The two mines of Marazzana and Perticara may be valued at from 30,000 to 35,000 tons of mineral per annum; the proportion of black sulphur is from 13.5 to 14 per cent., which would give about 4000 tons of refined sulphur, taking into account the loss of 5 per cent. for refining.

MINING IN THE EAST—No. V.  
CHARACTER OF THE ASSOCIATED ROCKS.

Metallic deposits of secondary age—by which must be understood those induced by plutonic action on mesozoic rocks—rarely, if ever, make permanent mining districts, since they are destitute of any vein systems, but are simply superficial deposits, induced by the contact of the eruptive matter with the sedimentary rocks. As, however, these contact deposits often contain large and valuable courses of ore easily and rapidly worked, and do not require the expensive pumping and hoisting machinery necessary for vein mining, it is important that deposits of this character should be studied in order to discriminate them by surface signs from true veins, which also sometimes show large oxidised masses on their backs, otherwise much capital might be expended in the wrong direction. These contact deposits have been largely mined in the Austrian empire—principally in the Banat—where they are numerous, and possess well marked and distinctive characters. They are found also on the Rio Tinto, in Spain, and in Norway and Sweden. At Chessy, near Lyons, these deposits are abundant, and the ores very beautiful, especially the azurite. In Russia extensive mining operations for the extraction of copper ores from analogous deposits are carried on at Bogoslovsk and neighbourhood in the Ural foothills. Those latter ores perfectly resemble those of Maidanpek, and demand similar treatment both by the wet and dry processes of reduction.

The mineral district is placed between mica schist on the west and gneiss on the east, although both often pass into each other and into slate, silicious, and hornblende rocks. A variety prevailing near the line of upheaval is hard greyish blue in colour, shining and finely gneissoid. The gneiss contains quartzose; granitoid veins which appear to prevail in long bands and quartzite masses are frequent. The metalliferous deposits, consisting of basins, nests, large lenticular masses, nodules, and impregnations, are as far as yet known entirely confined to and intimately connected with an upheaval of syenitic porphyry, bearing north and south, undoubtedly posterior to the original plutonic disturbances which resulted in the complete disruption and metamorphism of the sedimentary strata over the whole of Serbia. This minor upheaval can be traced for long distances outside of the Maidanpek domain, which it crosses. The porphyry, however, seldom appears, but has reached the present surface only in a few small knolls protruding at unequal distances, though there can be no doubt of its continuity in depth. It is probable that these felspathic rocks never reached the surface existing at the time of its upheaval, but have been partially exposed by posterior denudation. The name syenite has been usually given to the varied bosses of eruptive rocks found in Serbia and Hungary, but want of quartz, sometimes absence of hornblende, and the presence of so la, felspar, &c., seem to indicate that the term syenite leads to an incorrect conception of its character. As the rocks are so changeable, Von Cotta included them all under the appellation banatite, because it is in the banat of Hungary, where it has principally developed itself. The banatite of Maidanpek though changeable may be usually recognised when undecomposed as a greenish-grey felspathic paste, in which are embedded isolated crystals more or less numerous of oligoclase, hornblende, and rarely tabular reddish-brown mica; near the courses of pyrites it is much impregnated with crystals of mundie, which exposure renders liable to rapid decomposition; in depth this rock is hard, and where removed from the ore deposit would in Cornwall be unhesitatingly pronounced an elvan.

Overlying the ridge of the eruptive rocks, and following the line of upheaval, is a most peculiar quartzose band about 100 yards wide, containing minute crystals of cupreous sulphide of iron thickly interspersed in the containing rock. These crystals are very sensitive to the oxidising influence of air and water, which shatters the rock, and then cements the faces with a coarse green carbonate of copper. Thus this band at the surface is terribly decomposed and minutely fissured into angular amorphous shreds resembling nothing so much as heaps of mine attle. It accompanies the line of the porphyry many miles farther than the deposits of ore have been as yet worked, and certainly merits further exploration. The rocks composing this band have been so much altered and are so variable that it is difficult to describe them; they appear to have been gneiss, and they certainly blend off into true gneissose rocks. The banatite, though rarely observed at the surface, is always found in the levels driven in search of ore. The difference in the relative heights of the erupted masses is very great, but they are invariably accompanied by the escarpments of limestone, whether on the hills or in the valleys. There are two principal points where the plutonic force has apparently expended its greatest efforts, and these coincide with the richest deposits of copper and iron ores. Here the limestone has been thrust up so as to form escarpments some hundreds of feet in height; they are distant 3000 yards, and separated by a valley whose level is 1500 ft. below the most elevated limestone peaks. At the junctions of these knolls of banatite with the limestone are found the large lenticular masses and nodules of cupreous pyrites which were doubtless elaborated during the slow consolidation of the eruptive rock, and of the heated strata disrupted by it. The rocks metamorphosed are principally limestone, but shales containing thin seams of coal and sandstones, often calcareous, have also been much altered. The effects of the metamorphic action on these rocks are very varied and capricious, and the task of describing them would be difficult and for the present purposes unnecessary. It is evident that sometimes the contact rocks have reacted on the porphyry.

The limestone at its junction with the syenite has been changed into a white granular rock highly crystalline, which shades off into the usual blue limestone, and still farther distant stratification can be easily traced, and even fossils discovered—though rarely. In the tremendous precipices of these partially metamorphosed limestones may be seen magnificent illustrations of contorted strata. The linear elevation of the limestone has given rise to an interesting feature in the topography of the district described. Many valleys lying to the north of the limestone range resemble those of the Valley of Rasselas, being surrounded on every side by precipitous slopes, the only outlet being through immense caverns worn in the calcareous band of rock at the lower end of the valleys. Some of these valley systems are many miles in length, and several hundred feet deep, and the tortuous caverns which convey the drainage are often of great length and of vast dimensions, possessing the characteristics common to caves eroded out of limestone rocks. Swallet holes of all sizes exist on and behind these rocks through which the surface water percolates into channels beneath. Von Herder fell into the strange error of supposing that the smaller swallets indicated beds of salt, and recommended that exploratory borings should be made in them. The metamorphic action on the shales and sandstone is very marked and instructive, as they show a gradual change from unaltered strata up to a highly crystalline rock. The mica, schist, and gneiss have also been much disturbed and altered near the eruptive rock. The sedimentary strata are of Jurassic age. The secular solidification of the erupted belt has given birth to a gangue of a most peculiar and varied nature, replete with interesting modifications of the rocks affected. The escarpments of limestone are

closely accompanied by this gangue where they are in contact with or in proximity to the porphyry, but where the calcareous rock rests on sandstones there is no gangue, and but rarely and in no quantity when contiguous to the gneiss. It is difficult to say how the fragments of the disrupted rocks were disposed on the first result of refrigeration, or what they were, as the subsequent changes have been so great that they are not recognisable. These fragmentary masses have evidently been disjoined from the porphyry, limestone, and gneiss, and in losing their normal characteristics have originated new non-metallic minerals.

With regard to the ores of the metals found in this gangue there can be no hesitation in believing that they were first elaborated as sulphides—mundie, mispickel, copper, galena, and blende, the first-named in enormous quantities. When consolidation was far advanced chemical changes resulted in partial oxidation of these sulphides, and their deposition as precipitates either as oxides or native in favourable situations not far removed. When ages at length exposed by denudation the banatite and its associated deposits, the action of atmospheric influences intensified and extended oxidising changes, and the ultimate result has been the formation of the remarkable ores now exploited.

These occur as oxides, sulphides, carbonates, and hydrates, the quantity of sulphates and hydrates being enormous—as native copper and gold; as oxides, talc ore, cuprite, melaconite, hematite, and quartz; as sulphides, mispickel, lencopyrite, towanite, erubescite, covellite, blende, galena, and fahlerz; as carbonates, calcite, magnesite, white iron; as sulphates, cyanosite, copperas, selenite; and as hydrates, limonite, kaolin, soapstone, malachite, and chersylite. Many other minerals are found in small quantities, but although new minerals have been originated consequent on the decomposition, no new element has been introduced.

The original sulphide and the ores resulting from their decomposition are not sharply separated, but rather occupy alternate positions in the aggregate deposits. The position and the manner of distribution of the secondary ores are due to the conditions prevailing at the junction, where the broken masses and fragments of the various rocks disrupted have been thrown together in a somewhat confused mass, leaving large hollows and fissures, which have been subsequently filled with the super-hydrated silicates and oxides, containing a varying percentage of copper, principally in the state of hydrated oxides or sulphides. Abundant supplies of carbonic acid absorbed by the rains falling on the calcareous rocks assist in the decomposition of the sulphides. The sulphides decompose only within the influence of atmospheric changes, which seldom extend deeper than 80 fms. Below this the circulation of water seems checked. The same conditions which in the past have been originating the oxidised deposits are still existent, and as denudation lowers the surface the now deep sulphides will be gradually acted on, and the formation of secondary mineral products be continued.

EMPRESSARIO.

## AUSTRALIA.—ON MINING, SMELTING, &amp;c.

SIR.—I fully confirm my previous remarks, published in the *Mining Journal*, relative to the tin ore discovered in Tasmania. I now add further information as to the progress made since my last communication not only in Tasmania but in other parts on this side of the globe. First, I would observe that new discoveries are frequently made in the localities known as the Mount Cameron and Ringarooma districts, as well as in other parts of the island. Both tin and bismuth ores have been discovered at Mount Ramsay, but I am not aware that any of these discoveries have been sufficiently tested to enable anyone to speak in positive terms as to its commercial importance; but there can be but little doubt that when the roads are in better condition, and the tramway completed to Mount Bischoff, not only valuable discoveries will be made in the surrounding country, but the facility of sending the produce of the mines to market will be far greater than at present. I have recently seen a rich sample of gold and tin said to have been taken from the River Hellier, about 20 miles south of Table Cape; this, as far as the gold is concerned, corroborates my report sent to the Van Dieman's Land Company a few years since. Not only is alluvial tin frequently found to contain fine particles of free gold with it, but Mr. Wm. Berkmore has discovered that the tin ore known as ruby tin contains a small quantity of gold chemically combined with the oxide of tin, which is in all probability the colouring matter of that ore. It must be understood that the quantity of gold is far too trifling to pay for extracting.

The Mount Bischoff Company have smelted and shipped 249 tons of tin since July 1, but the furnaces were not kept in full work for want of ore, caused partly by scarcity of water to wash it. This company (the Mount Bischoff) are making steady progress, and very prudently depend more on the real merits of their property than they do in issuing highly-coloured reports. I am unable to give particulars as to what the other companies are doing at the Mount, but I learn some of them are sanguine of success. The Stanhope Company are smelting their ore on the spot with wood; whether this is a greater advantage to them than sending the ore to be smelted with coal can easily be proved. If (say) 10 tons of ore of the same quality be divided into two parcels of 5 tons each, let one parcel be smelted with the wood on the spot, and the other sent to the smelting works to be smelted with coal, keep an account of all the cost on each parcel, and the net proceeds will decide the matter so much talked of, and made somewhat perplexing for those interested in tin mines. As I mentioned in a previous report, I see no cause to fear that tin is likely to become a drug in the market from the discoveries already made in the Australian colonies, although it is highly probable that Tasmania will be considerably enriched by its mineral wealth. I find the large and well-constructed furnace for smelting iron on the banks of the Tamar will be at work in a few weeks, and there is every reason to expect that the results as far as the quality and quantity of the iron is concerned will be a success.

The silver ore recently discovered in New Zealand is said to be likely to lead to important results. The nickel ore found in New Caledonia is becoming an important article of commerce, about 200 tons per month are being shipped from Melbourne through Messrs. James McEwan and Co., the ore produces about 14 per cent. of metallic nickel.—*Melbourne, April 18.* JOHN HUNT.

## ON THE APPLICATION OF COUNTERBALANCING AND EXPANSION TO WINDING ENGINES.

SIR.—In the discussion that followed the above paper, read at the meeting of the North of England Institute of Mining and Mechanical Engineers, held in London last week, and reported in the *Mining Journal*, the observations I am credited with are incorrect, and quite unintelligible. The question put to the author of the paper was—whether he had seen the Corliss engine applied to colliery winding in Belgium, as I remarked that the Corliss valve gear was peculiarly adapted for this work, it having a variable expansion action, and being automatic it did not require the attention of the engine attendant, at the same time it was under his perfect control if desired. This system was a source of considerable saving in the consumption of fuel, as certified by the President of the Institution—Sir Wm. Armstrong—who, in the address to the society in 1873, stated that at Elswick ten small engines had been replaced by two large Corliss engines, that resulted in the saving of fuel by one of these Corliss engines alone of nearly 60 per cent.—i.e., a reduction from 60 tons to 24 tons of coal consumed per week.

The consumption of fuel with a Corliss engine recently erected was 14 *lb.* per indicated horse-power, the boiler evaporating 10 *lb.* of water per 1 *lb.* of coal. The cylinder was 14 in. in diameter and 4 ft. stroke, making 60 revolutions per minute, and indicating 153-horse power. With a boiler pressure of 165 *lb.* the steam entered the cylinder at 160 *lb.*, and when cut off at one-fourth of the stroke gave a mean pressure in the cylinder of 68 *lb.* This Corliss engine is compounded with a common slide and expansion valve engine, having a cylinder 24 in. in diameter and 4 ft. stroke. The loss of pressure between the cylinders was found to be about 1 *lb.*, and these engines indicated collectively 350-horse power. For colliery pumping it had given very satisfactory results, it having been at



work several years at the Halbeath Colliery, Fifeshire, where in practice it was found that the sudden breaking of a spear rod made no difference in the speed of the engine—often the cause of a serious breakdown in the engine or pump gearing.

This Corliss engine has a non-condensing cylinder 33 in. in diameter with a 4 ft. 6 in. stroke, and working by bell cranks two sets of 16 in. pumps in a pit 68 ins. deep. The bell cranks are driven by gearing in the ratio of 1 to 4—that is to say, the engine makes four revolutions for every stroke of the pumps, and the remarkable result is found that in the course of seven seconds the load on the engine varies between the extremes of 11 and 137 indicated horsepower, the engine being entirely regulated by the self-acting automatic expansion gearing. I trust that these remarks on the advantages of the Corliss engine for mining purposes may interest your readers.

Grove-street, Newcastle-on-Tyne, June 10.

WILLIAM PAGE.

#### THE TIN-PLATE TRADE.

Sir,—In reply to "Maker's" letter in last week's Journal with regard to my remarks on the use of tin in the manufacture of tin-plate, I think my statement substantially correct, that "some years since 13 lbs. of metallic tin were required in the annealing of a box of tin-plates," and it probably arose from the low price of metallic tin then ruling—in 1842, 67½ per ton; in 1843, from 60½, to 64½ per ton; and in 1850, from 81½ to 84½ per ton. The fact I wished particularly to show, that the high price of metallic tin in later years made it "important that the operation should be skillfully effected," is fully borne out by "Maker's" letter, showing that at the present time from 4 lbs. to 6 lbs. only is used (in the place of 8 lbs. or 9 lbs. mentioned by me), which I was not aware of, and am much obliged by the information; and thus my object in giving the quotation "some years since" being specially intended for comparison with those of the present time is fully attained, and show very forcibly the great improvement that has taken place in this important branch of manufacture.

June 10.

#### THE TIN-PLATE TRADE.

Sir,—My attention has been called to a letter signed "Maker" in the Supplement to last week's Journal, and the impression upon my mind is, that "Maker" will soon be numbered among those who have succumbed to the "pressure of the times." He imagines that fair cokes can be made with a consumption of 4 lbs. of tin per box (including, of course, all waste), and with 5 lbs. to 6 lbs. of tin for charcoal. He is evidently a "Maker" of a very cheap article! At the present time—taking plates called I.C.—7½ lbs. of tin is used on best charcoal, 6 lbs. on second charcoal, and 4½ lbs. on fair cokes. I unhesitatingly state that fair cokes sold now at 18s. f.o.b., Liverpool, cost just 21s. to the maker, when all delivery charges and interest and discount are added to the cost at works. It is true that some employers (and I am a very few, indeed, who adopt this ruinous policy) turn out as many plates as they can during the two weeks out of three when they are at work, because the greater the number made in a week the less the cost of engines, rent, fixed charges, &c., per box; but do they calculate the larger number of boxes sold at a loss far greater than the economy in fixed charges? I presume they do not; but if they do, their object can only be to find "ready cash" for present needs, and they leave the future to the chances of a turn in trade before the finale arrives to which they are hurrying themselves.—June 12. AN OLDER MAKER.

#### THE COPPER STANDARD.

Sir,—A "Mine Agent" informs your readers—"Mr. Barnard has the modesty to undertake to teach bal captains and Cousin Jacks how to dress copper ores," and, in response, I confess I consider it high time that someone had either the modesty or audacity to assist in the welfare of mining by pointing out any evils that may have escaped even the eyes of critics, and imparting scientific information to some of the representatives of valuable mineral properties, who are incapable or too indifferent to suggest any improvement themselves.

It is all very well for "A Mine Agent" to ask me to give the names of miners mixing 10 per cent. with poor ore in order to sell the latter, why does he not calmly propose I publicly mention the cognomen of many mining men that I know, absolutely know, to have no faith in mining as a legitimate, profitable enterprise, and behind the scenes with their brother actors openly and boastfully confess it. Men who have no brains to suggest anything that will advance the true and only genuine honourably gainful branch of a business fast going to the dogs, men who have no thirst for science or improvements, but yet are like vultures waiting for their prey, ever on the watch to catch the unwary by applauding to the skies any property in which they have an interest and desire to exchange for cash. It is not one, but every copper mine from time immemorial to the present day that has attempted, and still attempts, to win a larger income by either fallaciously mixing poor and richer ores together for the smelters, or endeavours to concentrate poor ore to rich by the ordinary well-known methods of washing and dressing, familiar as household words to the "One and All."

In my dissertation upon the Copper Standard I did not refer particularly to 10 per cent. ore being mixed with poorer qualities, but one thing is clear—and a "Mine Agent" can see it proved by the figures in my last letter—that the richer the ore used for mixing purposes the greater the chance of introducing low-class stuff into the ticketings with the least loss; but the whole is a wretched farce, and as for mixing 2 to 3 per cent. with 5 to 7 per cent., instead of 10 to 15 per cent., the result is even far more disastrous than the figures which have already appeared in your columns. Your correspondent refers to "any taker of an old halvan burrow." I presume he means me to gather from this quaint statement that low-class ores are concentrated and made merchantable, not with mixing, but by the old fashioned style of washing and dressing. I do not dispute that some ores can be concentrated by this method, but the loss of copper is most serious, and for an example let us take the enriching of 3 or 5 per cent.—say 5 per cent.; now, with 100 tons 5 per cent. gives by act as well as figures 50 tons 10 per cent. No! Why? Because "A Mine Agent" knows well, and so does any "taker of an old halvan burrow," that the copper washed away and left in the old 50 tons would be at least 20 per cent. of the whole; we thus have, instead of 100 tons 5 per cent., not 50 tons 10 per cent., but with a 30 per cent. loss, 50 tons 7 per cent. Standard 104½ 3½, or 4½, 12s. per ton, equal to 250½; set this off against 100 tons 5 per cent. at 2½ 12s. 6d., or equal to 252½ 10s., a loss after all the washing and dressing of 32½ 10s. I have no doubt "A Mine Agent" will have the remark ready that "any taker of an old halvan burrow" would dress 5 per cent. ore if set about it, up to 10 per cent. Granted; but the loss of copper must be greater, however; consider the loss in this calculation again as only 30 per cent., which gives 35 tons 10 per cent. ore, produced from 100 tons 5 per cent. Standard for 10 per cent. 98½ 18s. or 7½ 2s. 9d. per ton multiplied by 35, equal to 249½ 16s. 3d., still a loss; and, further, washing and dressing 100 tons means cost. Where are we now? Somebody must be in a dense fog, as this copper mystery is greater than ever. Perhaps "A Mine Agent," or "any taker of an old halvan burrow" will separately or together kindly throw a light upon the subject. In conclusion, I would particularly mention that some copper ores, and especially the low class, will not concentrate at any cost, even when the one hundred and one gentle persuasions of "Cousin Jack's" dressing-floors are brought to bear upon them.

Permit me to furnish a little account of what actually took place some few months since not 20 miles from Plymouth. A certain mine had an at 2000 tons of copper skimpings, giving 1½ per cent., with, unfortunately, but precious little rich ore for mixing purposes, when it was resolved to send a parcel to the ticketings; the smelters further resolved to offer 1s. per ton, which was duly carried, much to the disgust of the representatives of the certain mine, who then set earnestly to work, as "A Mine Agent" or "any taker of an old halvan burrow" would, to get a smaller quantity of richer material by the old style of washing and dressing. Neither zeal nor expense were spared; but lo, behold! when they came to try a sample of the

lead, or concentrated matter, it gave but 1½ per cent. The cart, as it were, actually having run away with the horse, or, at least, moved it, for the tails or reject material had sprung upwards from 1½ to 1½. This was a grave affair; had the cart taken a more determined move all might have been well, for if a few tons of 5 per cent. had been produced the amount of copper washed away would never have been once taken into consideration. But every old-fashioned scheme was tried and failed, and the residue of the pile of skimpings still exists as a monument to prove at some future date the relative value between the "Nascent Copper Process" and—well, what shall be the simile? I cannot find a better than "Any Taker of an Old Halvan Burrow."

Trafalgar House, Plymouth, June 13.

THOS. J. BARNARD.

#### THE COPPER STANDARD.

Sir,—I consider it folly for "A Mine Agent" to sneer at the letter upon this subject produced by Mr. Barnard; if not in words he in tone denies that poor parcels are passed off mixed with rich ore. It is a common daily occurrence at our mine of mines—the Devon Great Consols—the mixing of ores to get rid of the low class that will not dress any richer by washing, and the agents of this and other mines make no secret of it. I think it quite out of place Mr. Barnard coming forward as a tutor, for his public career can show nothing but mis-takes, and I hear the Nascent process has ended in lamentable confusion at the New Consols and other mines; still give a man fair play, let him have his say, and try again; we are none of us immaculate, and all the while he sticks to facts and figures, as he did in his last compound production of instruction and amusement, he will find a supporter in—

A LONDON BROKER.

#### THE COPPER STANDARD.

Sir,—How does Mr. Barnard reconcile his "facts and figures" about mixing poor and rich ores with the sales made by the Devon Great Consols? As I have often observed parcels of hundreds of tons realising less than 12 per ton, and in some cases only 5s. per ton. This does not look like mixing. I do not wish to annoy Mr. Barnard, or throw cold water upon his efforts, which seem, and I believe are, genuine. I merely ask for information, and "pause for a reply," in the meantime shall look with interest for his reply to "A Mine Agent."—Scarborough, June 13

C. F.

#### BORING MACHINES FOR MINES—EXAMPLE BETTER THAN PRECEPT.

Sir,—Your correspondent, Mr. George Rickard, boasts of having per-istently advocated the introduction of boring machines to mines for some time past through the medium of the Mining Journal, and appeals to you, Sir, as a witness of that fact. I shall, therefore, assume that the statement is true, but as I am given to understand that Mr. Rickard is a mining man, if not a mine agent, I am led to ask why he does not practice that he so strongly recommends to others, especially as he pretends to know the cause or causes of failure which have hitherto attended the efforts that have been made to adapt boring machines to mining? He states in his letter, published in the Supplement to last week's Journal, that "there are various reasons why better success has not attended the subject, [trials, I presume, were intended] which are very plain in themselves, and might have been obviated." And then it is added—"It is not, however, my intention to go into that part of the question"—it has to be fought out. May I ask by whom, and when? If everyone shrinks the question, as he appears to have done at this point, when is the battle to commence? He entertained us with a paradoxical exordium, and abruptly left off where I thought he was going to begin.

If the difficulties which beset the successful introduction of boring machines in mines are very plainly to be seen, those who have hitherto been making the experiments must be exceedingly limited in their range of vision; and where blindness prevails and so much is lost, consequently it would only be generous on the part of Mr. Rickard to shed a few rays of light on the subject, from what may be supposed his broader experience and more brilliant intelligence. But possibly diffidence afflicts him, and he wishes to be invited. Would it not be politic on the part of the manager and engineer of Dolcoath to court his co-operation? I always think it the better way when a person pretends to be wiser than everyone else to put it to a practical test. If he were successful, it would be a good thing not only for Dolcoath but for mining generally, and also for Mr. Rickard himself. It would establish the validity of his claim to superior prescient knowledge as compared with his rivals, and raise him in the estimation of thousands whose interests would be promoted by the force of his genius. He would most assuredly attain to an almost boundless popularity as the friend and rescuator of a great national industry, which but for his timely intervention and aid must have become obsolete from sheer inanition. Perhaps Mr. Rickard would undertake to achieve the success he speaks of, and consent for his remuneration to be contingent upon its satisfactory accomplishment.

MINER.

#### UNWROUGHT MINING GROUND OF CORNWALL.

Sir,—Since the introduction of this subject evidence of productive veins in unexplored ground is constantly occurring. The valuable discovery of West Public, which I long since advocated the working, has been a stimulus to the prosecution of other virgin ground, and there are in store several properties to be worked, which for analogous reasons I have no hesitation in pronouncing that (on a small judicious outlay) greater and more valuable mines will be opened. After a careful examination of one in the neighbourhood of the rich Gwennap Mines, it has been pronounced to be of that kind of enterprises which partakes more of the form of an investment than otherwise, it having all the elements of a great and valuable mining property. A glance at the prospectus of Silver Hill Mine, in this week's Mining Journal, will give the public to understand that an interest in such properties is to be obtained for a small outlay. Here, as in the Cifford, Great Consols, and Trevaun (these three alone have given nearly a million profit), are to be seen masterly east and west copper lodes, with the cross-course intersections and in immediate connection with the well known and much-esteemed old courses, which to any miner is of itself a comprehensive report; indeed, it is only in connection with such cross-courses and upheaves that the deposits of mineral wealth are to be found, demonstrative proof of which I hope shortly to give by the opening of a permanently productive mine.

C. BAWDEN.

#### DEPOSITS OF COPPER AT NANTLE VALE, CARNARVONSHIRE.

Sir,—I have shown in these letters the various facts which have come under my notice during my six years residence here, together with those furnished me by reliable persons which had taken place previously. I have also made some few inductions from those facts which are the only reasonable ones I could suggest. A person asked me the other day, "Can you put copper there?" to whom I replied that my object was to endeavour to render some assistance to any who may be in search of it; for although there is not yet known any law which will enable one to say with certainty where deposits of copper are to be found, yet the knowledge which we obtain by a careful study of the various phenomena will materially assist. If we cannot say with certainty where the deposits of copper are, it is certainly an advantage to be able to say where they are not. This I think we can do, for if copper never was discovered under certain conditions, we have reason to believe that where those conditions exist no copper can be found, and, therefore, a useless search is prevented. Looking at what has been done in the copper mines of Carnarvonshire, and the pleasing results where money has been judiciously spent, I have reason to believe that at some future day, especially should the copper market improve, the county, and about the Snowdon range in particular, will establish a splendid reputation for copper mines. The Symde Dylluan Mine has a mile's length on the course of the veins, and only about 300 yards of

the whole length has been tried, and from these bits of holes hundreds of thousands of pounds worth of ore have been sold. I believe that in the western section of the set, where as yet no trial whatever has been made, there will be found some of the best copper in any yet seen in the mine. And Drws-y-Coed Mine also has any amount of virgin ground, equal, as far as anyone is capable of judging, to any yet wrought on. Whoever tries any new ground in any visible at the surface of the ground which has been already worked on and proved so productive.

Carnarvon, June 14.

JOHN ROBERTS.

#### CARDIGANSHIRE MINES.

Sir,—I hope our two friends have not, like the Kilkenny cats, devoured each other; it would be a sad day for Cardiganshire mining to lose two such brilliant lights, to say nothing of the check it would be to the flow of capital we were led to expect. I have been anxiously awaiting the florid report of the check it has been a great disappointment to open your paper week after week, and see nothing about it.

I saw last week some very sensible remarks about Crown dues, and also a history of West Esgair Lle Mine. Something ought to be done to give the office of Woods and Forests a lesson, and to check the system of black mail now levied by them. I think it would be a good plan for the Crown lessees to join in making some application to Parliament either for a Royal Commission of enquiry, or for a Committee. The present system is utterly unbearable, and if practised by a private landlord would lead to a general outcry; but because it is the Crown, which instead of fostering mining enterprise trusts everything may be done. I would willingly subscribe my quota of any expense. Will not Mr. Davis, of Llanidloes, himself a miner, take up the cause for us?

HARD TIMES.

#### NEW CONSOLS.

Sir,—The proprietors of this mine—I no longer call them adventurers or speculators (for the mine has ceased to be a speculative work)—seem resolved to carry out the operations on an extensive scale, knowing that the larger the scale the larger will be the profits. Sir James Anderson, a large shareholder and chairman of the company, has visited the mine underground and at surface in all its details, and has satisfied himself as to the quality of the lode and of its inexhaustible resources, and I hear that Capt. R. Pryor, the manager, has received instructions to cause to be constructed two additional Brunton's calculators. Of course these will add materially to the returns. Mr. Stierthwaite, one of the directors, who takes a great interest in the operations, is now at the mine, and is also, I am told, fully satisfied with the condition of affairs. This mine may be regarded as a prize, not only for the shareholders, but for the population of the district, by affording employment to a considerable number of hands, which are long lying, probably, in great unemployment. Of the continuance of the operations no doubt exists in the minds of the intelligent that no one living will see the end. Houses at Llanelli are much wanted, and I suppose will see the end when everyone becomes satisfied of the durability of the workings. It is said that the railway marked out by Mr. Sims (from the East Cornwall Minerals Railway to the mine) is likely to be executed before long. We in Cardiganshire derive benefit, of course, from a mine situated so close as New Consols is, and I for one regret that I am not a shareholder in the company.

Callington, June 14.

[For remainder of Original Correspondence, see to day's Journal.]

COPPER MINING IN AUSTRALIA.—The half-yearly report of the Moonta Mining Company is one of a highly gratifying character. Whilst the magnificent returns of ore are maintained of average quantity and quality, there is no immediate indication of the yield diminishing in future. A time must come, of course, when the returns of the mine will become small by degrees, but that time is so far distant that any present apprehensions excited concerning it would be mere waste of thought. The deepest shaft in the mine is Taylor's, which is down 148 fms., and although the part of the lode carried in the shaft is at the 145 fms. level, the ground, the manager says, will not be met with further south, and the manager, we may be sure, would not commit himself to this statement unless he were well assured, from his long-continued experience of the ground, that his prediction will be verified. And if a lode proves to be at a depth of 145 fms. there is every probability, provided that no unexpected change of strata occurs, that it will continue productive at an indefinite depth. The richest portion of the mine at present appears to be the ground connected with Ferguson's and Prince Alfred shafts. Respecting the lode in this quarter, the report speaks of pitches producing ore of 20 per cent., and of several "alluvials" of high class ore. Whilst many of the lodes, however, are in places of surprising richness, and were well worked, from his long-continued experience of the ground, the manager says, will not be met with further south, and the manager, we may be sure, would not commit himself to this statement unless he were well assured, from his long-continued experience of the ground, that his prediction will be verified. 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## Meetings of Public Companies.

## WEST PATELEY BRIDGE LEAD MINES.

Until recently Pateley Bridge, as an important mining centre, has been scarcely known to the investing public, although favourably situated for the accommodation of the tourist about to explore this most interesting portion of the West Riding of Yorkshire. So ancient is the town that it is difficult to obtain any reliable information as to the precise date of its establishment; when forming simply a cluster of shepherds' huts near the river, it is thought to have been known as Herford, while the land around it was the "ley" or field of the "pate" or badger, an animal formerly common in the dale. When the bridge was built, and the ford disused, the old name was continued, the place becoming known as Pateley Bridge. Until 1862 the district had been without railway accommodation, at which time the North-Eastern Railway completed a single line, after having the by amalgamation or otherwise obtained exclusive control of the whole district. Though but a single line, it is of great utility to the country through which it passes, affording facilities for the development of the mineral riches of the district. Its antiquity as a mining centre is shown in many ways—that the Romans worked the mines there is sufficient evidence by the existence of pigs of lead bearing the Roman stamp, and dated as early as the year 81.

The metalliferous region is known in the locality as the Greenhow Hill, about four miles from the town and railway station. On the slope of this hill are situated the lead smelting works of Mr. John Yorke, of Beverley, where all the ore raised within his royalties are smelted; here it may be mentioned that Mr. Yorke is the grantor of the West Pateley Bridge Lead Mines. In early times the pigs of lead have been cast in stone pans, one of which, yet preserved, was found inverted under the foundation when the old smelting mill was pulled down; the cavity in which the pig was cast is about 2 ft. 6 in. in length by 6 in. in breadth, narrowing suddenly at each end to something like a handle. A short distance above this place, Mossbeck and Merryfieldbeck form a junction; from the latter stream is derived the water which turns the wheels and fans at the smelting works. The valleys down which these brooks flow, and the lateral gullies from which they are supplied, have been described as the most singular, rugged, irregular, broken, disjointed pieces of ground it is possible to conceive; their whole appearance seems to indicate that the force acting from beneath which upheaved the limestone, forming the mounts of Coldstones and Greenhow, has cast the superincumbent beds of gritstone upside down in huge irregular masses, and that those masses have afterwards been subjected to the action of water in rapid motion. On the north side the rocks are granite, alternating with beds of shale; on the southern side rises the great mass of mountain limestone to a height of 1400 ft. above the sea level.

As Greenhow Hill seems destined once more to occupy an important place among the mining districts interesting to investors, it may be useful to note that the ridge rises in two sinuities; from both of them the beds dip rapidly from the north and south, the dip diminishing as the distance from the axis augments. Numerous metalliferous veins cross the ridge, ranging east or east-south-east, traversed by north and south lines of irregular cavities, called gulphs, which are full of the broken portions of the bordering rock. Shales and grits of great thickness, enclosing a thin limestone, envelope on all sides the oval mass of Greenhow limestone, which is more than 100 fms. thick, the bottom never having been reached. All the ground bears evidence of workings, old or new, and the surface is strewn with innumerable heaps of leadings which have come from the bowels of the earth, among which are immense quantities of fine white spar.

Upon this hill, and certainly in the most advantageous position, are situated the West Pateley Bridge Lead Mines, occupying an area of about 3 mile square. Some 12 or 14 masterly and well-defined lodes traverse it, besides many north and south veins, forming numerous important intersections. West Pateley Bridge is surrounded by productive mines—Pateley Bridge on the east, Grassington on the west, East and West Craven Moor on the south, and Merryfield and Netherdale on the north. Some of these mines have been worked at considerable profit for centuries, and are still rich. The Grassington Mines, worked by the Duke of Devonshire for upwards of 70 years, gave, it is said, for a long period a net profit of more than 70,000, per annum. The east and west lodes of the Pateley Bridge Mines, and the north and south lodes of the East and West Craven Moor, cross each other in the sett. In the outcrops the lodes have in former times (about 70 years ago) been extensively worked to the then water level, and the numerous heaps of dressing debris in the immediate neighbourhood of all these excavations show that enormous quantities of lead ore must have been obtained.

The developments in the adjoining mines demonstrate the continuity and increasing richness of the lodes in depth, and as West Pateley Bridge is now an "artery" to a depth of not less than 56 fms. by one of the main levels of the Pateley Bridge Mines, forming a portion of the east and southern boundary, the computation is by no means an unreasonable one that many thousands of fathoms of lodes are standing high and dry, to be taken away at something like 50 per cent. less than the ordinary cost, no pumping machinery being required. Prominent and varied are the physical advantages possessed by this important and as yet most imperfectly developed section of mineral ground, while the veins south, worked to a depth of from 15 to 25 fms., have all proved rich and productive to the deepest point explored. Six or seven of the most valuable veins in Pateley Bridge Mines, where at a depth of 100 fms. below surface each is becoming increasingly profitable, traverse the entire length of West Pateley Bridge; up till now this series of veins, although yielding satisfactory results in the adjoining property, are unexplored; here, they can be seen crossing from one mine to the other in the joint adit level. Several eastern pits were put down by the former workers upon the backs of some of the lodes, but could not be continued without the aid of expensive pumping machinery. Permeant and inexpensive drainage having been ensured to a depth of 56 fms. from surface, the present company propose to develop these already proved lodes by means of cross-cuts from the joint adit level. As we have already pointed out, this will give 56 fms. of "backs" upon these several lodes available for immediate working.

The importance of these speedy and cheap cross-cuts is that the lodes can be developed at one-half the cost as compared with working from surface, while at the same time proving them to a considerable depth. These operations will lay open an ample available area of mineral ground equal to the requirements of any company, however extensive its scale of operations, without any reference whatever to the developments that may hereafter take place below the water level. It may here be pointed out that the Pateley Bridge levels are being driven up to the boundary, and the probability is that by the time the upper section of the lodes shall have been worked away the deeper levels in the adjoining property will have reached the boundary, thus draining the West Pateley Bridge lodes to a further depth of 30 or 40 fathoms.

These mines when formerly worked were owned by small local parties with only limited means; at that time pig-lead realised only 11s. per ton, whereas it is now worth 21s. per ton. The royalty was 15 miles of the mines, now within 3 or 4 miles. One of the projected works of the present company is to drive cross-cuts through lodes, each of which has proved productive so far as explored, some yielding enormous riches.

The above facts show that there are few mines capable of such speedy development, and so likely to yield profitable results upon a small expenditure. The ore can be broken and loaded into the wagons, saving the cost of hauling to surface. At the productive lodes the lodes are very soft and easy to work, and the lead being almost pure requires little or no dressing, the associated minerals assisting as a flux in smelting. As the ore is smelted by the company itself, the smelters' as well as the miners' profits will be realised, amounting to at least 20s. per ton. The pig-lead is also sold on the spot for immediate cash, whereas in other districts the

ore has to be sampled, trucked, shipped, and paid for in three or six months' bills in lieu of ready cash.

In the adjoining mines the lodes have proved productive from surface and are now opening out richer than ever before at a depth of 30 fms. below the joint adit level, and in face of primitive workings returned in bygone times for many years profits amounting to 30,000, per annum. Significant is the fact that all these veins are standing whole in West Pateley Bridge Mines. Some portion of the surface is covered with a series of peat beds, which prevented these lodes being worked until drainage had been effected by the joint adit. Although the present company commenced operations not more than three months, since one shaft has been sunk to a depth of 8 fms., and another 7 fms.; in both, courses of lead ore have already been met with, and are being rapidly opened out. As the lodes are so close together there is the advantage that a short drive at any shaft will intersect the respective veins at a trifling outlay. The No. 1 shaft is being sunk upon the vein traditionally known as the Golden Fleece, and No. 2 shaft upon a branch of the famed Rake vein, which has a complete history in the district, having according to the old miners yielded enormous treasures in former times. Certain it is, that this vein has been most extensively worked here by surface operations for nearly half a mile in length and several yards in width, and the sales of these extensive workings are reported to have been left very productive. Some 20 years since two working miners sunk a shaft, and in a short period realised a profit of 4000, These old miners are still alive, and their comfortable appearance and position seem to fully confirm this statement.

The cross-cut in the joint adit level being in the cross joint can be driven at the rate of from 7 to 8 fms. per month, as against 3 to 4 fms. in the ordinary limestone rock. The Craven Cross vein, one of the most celebrated in the district, is expected to be reached in a few weeks. This in itself is a point of great interest, inasmuch as a course of solid ore 3 ft. wide was extensively worked from surface upon this vein; wherever cut it has always been very rich. The leadings on the surface indicate that this vein alone must have returned thousands of tons of lead ore. Another of the veins this cross-cut will shortly reach is one that in the adjoining mine produces courses of ore of 10, 14, and 18 in. of nearly solid lead, representing an aggregate value of something like 200, per fathom. The Jarrot and Sun veins, which records show have always been amazingly rich, and worked as far back as the time of Claudius Cæsar, are fully maintaining their character in the Pateley Bridge Mines. Upon the Sun vein an important discovery has just been made. These two veins will also, at no distant date, be reached by the joint level cross-cut in West Pateley Bridge.

The success of the surrounding mines, the proved continuity of their lodes through this property, and the extensive excavations thereon, the results now being obtained from the works in actual progress, and the fact that no pumping machinery with its attendant cost will be required for at least a great number of years, justify the directors in recommending this undertaking to investors as being one free from ordinary mining risks. It is believed that after a few months working lead will be returned in sufficient quantities to yield very handsome dividends, increasing in amount as the works progress. The capital is 20,000, divided into 50, shares.

The statutory meeting of shareholders was held on the mines on June 9. Mr. GEORGE BRIDGER in the chair.

The notice convening the meeting was read.

The CHAIRMAN said he had at the outset to apologise for the unavoidable absence of Lieut.-Colonel Todd from domestic affliction. Shareholders were aware that this was only the statutory meeting required by the Companies Act to be held within four months after registration, and that the business to be transacted was necessarily of a purely formal character. But those shareholders who had done the board the honour of attending to day had had the opportunity of inspecting their property, and of seeing for themselves the very many indications of successful mining in the past. He believed he was reflecting the opinion of everyone present when he said that to-day's inspection had given them considerable confidence in the future of this undertaking. Mining they all knew was naturally of a very speculative character, but he thought they would all agree with him that in this particular case ordinary mining risks were reduced to the lowest possible minimum, and that the property might with confidence be regarded as an investment rather than a speculation. When solicited to associate himself with the company he stipulated that he should first have the opportunity of investigating its whole affairs to satisfy himself of its bona fide character, and that he should also be permitted to make a personal inspection of the property before he gave his answer. He was met in the fairest and most honourable manner, every information he required being afforded in the frankest way. He visited the mine when Capt. David Williams, the manager, readily replied to every question put to him, and now it was but justice for him (the Chairman) to say he had the fullest confidence that under the able supervision of their experienced manager West Pateley Bridge Lead Mines would quickly prove a permanent success. Upon that occasion he also had the opportunity of conversing with several persons in the district, including some old miners who had known the mines when last worked, and although their extraordinary statement as to the riches then realised must, of course, be accepted *cum grano salis*, the information certainly could not fail to produce any effect other than one of satisfaction and confidence in the great wealth of the property. By all he could gather from documents, as well as *visu et voce* examination, no less than that which was apparent to one's observation, there was every reason to fully believe that upon a slight development and a small expenditure grand results would be realised. He congratulated the shareholders upon having acquired the property on most reasonable terms, so that only a small output of lead would be sufficient to ensure satisfactory dividends, the vendors showing their confidence by accepting paid up shares in lieu of purchase-money, thus identifying more closely their interest with that of the shareholders in the success of the enterprise. A feature worthy of remark was the fact that the greater part of the present operations was done upon tribute; in other words, that the miners themselves were so satisfied as to the result that they willingly undertook the working of the shafts for a small percentage of the value of the lead yielded during the operation. When they found practical and working men, whose time was their only capital, ready to labour entirely upon such a speculation he did not know that more conclusive evidence could be adduced as to the value and dividend-yielding capabilities of their mines. Already these miners were being handsomely repaid for their labours, and at the same time the company were realising a satisfactory profit. He would not now dilate upon the various stories told him as to the fabulous wealth under ground, it was sufficient for him to know that they owned a series of mines with many rich veins that could not fail to yield upon development handsome and progressive profits. He would now call up in the manager to read his report, and should be very pleased to answer any question to the best of his ability.

Capt. D. WILLIAMS (the manager) read the report as follows:—

June 9.—The West Pateley Bridge Lead Mines are situated on the slope of the celebrated Greenhow Hill, about 4 miles from Pateley Bridge, and on the site of the high road leading from that place to Skipton. The property is in the centre of the most celebrated mining district in Yorkshire, with Pateley Bridge Mines on the east (the latter having upwards of 8 miles of horse levels underground). On the south by Craven Moor Mine, on the west by the Grassington Mines (the property of the Duke of Devonshire), on the north by the celebrated Merryfield and Stoney Grooves Mines. The West Pateley Bridge is known to be traversed by twelve or fourteen well-defined lodes, with several cross lodes and floatings. The workings consist principally of several small shafts, varying in depth from 15 to 25 fms. upon the Rake vein, all of which, from indications on surface, have produced large quantities of lead. The dressing hitherto has been carried on by manual labour, and without the aid of mechanical appliances, but notwithstanding all these difficulties and disadvantages the mine was wrought at a profit. This imperfect system of working is to be accounted for by the fact that the property has hitherto been owned by local parties with slender means.

The 56 f. level, which is the deepest point in the eastern section of the property, is a joint adit with Pateley Bridge, and driven west to Craven Moor engine shaft (a double drawing shaft). All the ground above that depth is clear of water. A short distance east of the joint adit a cross vein intersects the level, and is nearly 2 ft. wide; by driving north on this level other lodes will be intersected, the first in about 15 to 20 fms. from the adit level, and was extensively worked on surface. The second is the Rake vein, which is very rich as deep as could be worked for water, and yielded very large quantities of lead ore, and all the sales were left rich; it will, I believe, be found very rich at this depth, and by driving west on the lode the level will be driven under the workings referred to, lying

open from 20 to 30 fms. of ore ground in height for stopping. The other lodes have not yet been worked in West Pateley Bridge Mines, but are run and worked upon, and have proved rich right up to the boundary of this mine from Pateley Bridge Mines, and yielded thousands of tons of lead ore. Their best course of ore now, which is worth about 4 tons per fathom, is on one of these lodes. As some of the above lodes have a north-west and south-east bearing, and the others an east and west, there are numerous intersections which cannot fail to be very rich. No pumping machinery will be required, as the ground available for stopping over the backs of the level, provided that cross-cuts be driven and levels extended on the lodes, will be sufficient for the most extensive scale of operations, to say nothing of the ground beneath. The sett is nearly 1 mile on the line of the lodes, and about the same in width. Royalty 1-14th pig; distance from Skipton 3 to 4 miles; the lead ore will average 75 per cent. in pig lead; cost of smelting, including fuel, labour, &c., about 22s. per ton.

Since the company commenced active operations the drawing shaft from surface has been repaired to the adit level, and the latter cleared and repaired 80 fms. east of shaft, and a level extended north upon a cross lode about 17 fms. to intersect St. Mary's shaft, Craven Cross, and North Rake lodes, and most of the productive lodes worked in the Pateley Bridge Mines, at a depth of 56 fms. below surface. Having during the last few days cut several branches of spar, and a change having taken place in the dip of beds and colour of the limestone, I have no doubt we shall very shortly cut the Craven Cross lode, and will drive west upon the same, to get underneath the rich ore ground left in the shallow workings above, from which place alone regular and profitable returns of lead ore will be made. We have commenced driving a cross-cut upon a vein about 24 ft. west of west of shaft and 42 fms. from surface, in the forebush of which I am informed a very promising lode was just cut out. We shall continue this cross-cut north, and drive east and west upon the various lodes. No. 1 shaft from surface, upon Golden Fleece vein, is sunk 7 fms., and the lode in the bottom is worth 9s. per fathom for lead ore. This point is let for two months as a metal pitch at 60s. per ton, or 150s. per ton, including raising and dressing. No. 2 shaft from surface is 8 fms. in depth, and a level driven east upon the lode 3 fms. is worth for lead ore 7s. 10s. per fathom.—DAVID WILLIAMS.

Mr. F. W. MANSELL said it afforded him much pleasure to bear testimony to the correctness of the various reports from different practical authorities which had been submitted to him for perusal. Accompanied by the directors and manager, he had carefully inspected the West Pateley Bridge Lead Mines, which, while containing among others the richest veins in the adjoining Pateley Bridge Mines, had many merits and natural facilities unpossessed by any other undeveloped section of mineral ground within his knowledge. Besides several north and south veins there were at least a dozen highly productive east and west lodes, all having proved more or less rich as far as the ancients had been able to work them, and there were those who had the necessary information showing that, although the ore dressing operations were carried on by manual labour without the aid of mechanical appliances, considerable profits were realised. They had to-day seen that the mines were now drained by a main day level to a depth of 56 fms., and that no pumping machinery would be required, the ground available for stopping as soon as cross-cuts and levels had been driven on the several lodes being sufficient for a most extensive mine for many years, to say nothing of the mineral in depth; and important indeed was the fact now being so fully established at the Pateley Bridge Mines that all the ore deposits of this great mineral district gradually enrich in value not only in depth, but in the neighbourhood of the various intersections. The ore he found averaged 75 per cent. in pig-lead, that the cost of smelting, including fuel, labour, &c., was about 22s. per ton, while the cost of drifting upon the lodes was from 50s. to 70s. per fathom, and of sinking 5s. to 10s. per fathom. With a property traversed by so many productive lodes, and possessing unusual facilities for their speedy development, the least sanguine among them could not regard it an unreasonable expectation that a few months active operations would enable the mines to return lead in sufficient quantities to realise good profits, and pay satisfactory dividends.

Lieut.-Col. COMYN said that he had several questions to put to the manager, not so much with the view of obtaining information for himself, as that absent shareholders should be placed in possession of every fact, and know as much as the directors themselves. It afforded him much pleasure to find that they had present Mr. F. W. Mansell, who was a much more practical man than himself, and no doubt that through his enquiries much valuable information would be elicited. He (Colonel Comyn) would ask when it was completed the Craven Cross vein would be reached?—Capt. WILLIAMS said according to the dialling it should be reached in about a fortnight or three weeks. He looked upon the recent change in the ground as most encouraging, the limestone now being fire red—whenever a change took place in the colour of the rock the vein was close at hand. These indications, coupled with the dialling, led him to expect that the Craven Cross vein would very soon be reached. As soon as cut he proposed to drive west on the lode, so as to get underneath the rich course of ore that went down of great value from near the surface.

Mr. MANSELL asked if the shareholders were to understand that this mode would open up the mine quicker?—Capt. WILLIAMS replied in the affirmative, adding that a lode would be intersected which contained solid lead 1 yard in thickness.

Mr. MANSELL asked how deep that had held down?—Capt. WILLIAMS: It was followed down to a depth of 37 fms., where it remained fully 3 ft. of solid lead to the fathom.

Mr. MANSELL: When would this vein be intersected?—Capt. WILLIAMS: According to dialling it should be reached in about three weeks.

Mr. MANSELL: But how many fathoms had to be driven before coming under where it was so rich?—Capt. WILLIAMS: About 60 fathoms, and 8 or 9 fathoms could be driven per month.

Colonel COMYN: Why were not these points tried by the former workers?—Capt. WILLIAMS: Simply because they were prevented from doing so by reason of the influx of water. Now the old ground had been permanently drained by the joint adit, and the several productive lodes could thereby be extensively explored. When formerly worked pig-lead was only worth about 11s. per ton, and the royalty was 1 sh. instead of 1 1/4 sh., and coal was now about one-half the price, owing to the railway to Pateley Bridge.

Mr. MANSELL asked Capt. Williams if he saw any reason to alter his opinion that the various lodes would be rich at a depth of 56 fathoms by means of the joint adit?—Capt. WILLIAMS said the more he saw of the property the more confident was he that these lodes would be rich, besides which the lodes were maintaining their productivity at the deepest point in Pateley Bridge.

Mr. MANSELL said these lodes had been profitably worked in Pateley Bridge Mines for many centuries, and estimated to have yielded during that time mineral to the value of nearly 1,000,000. Was it, he would ask, a justifiable expectation that these lodes now standing high and dry in West Pateley Bridge Mines were likely to yield as much mineral during their development down to the water level, or 56 fathoms from surface.

Capt. WILLIAMS said there was every indication at present to confidently believe that such would be the case.

Colonel COMYN said he had ascertained from enquiries in the district that wherever struck the Craven cross vein had always been very rich.

Capt. WILLIAMS added it had always been very productive in the Pateley Bridge Mines.

A SHAREHOLDER asked if the Golden Fleece vein, upon which No. 1 shaft was being sunk, was improving?—Capt. WILLIAMS replied in the affirmative. All lodes in that district were subject to "nips" and "opens," and this vein was now opening out in a most satisfactory manner, the significant feature being that it had taken its proper bearing, and had good wells nearly perpendicular. It was composed chiefly of carbonate of lead and calc-spar. That lode had been let on tribute at 7s. 10s. per ton when it was, including dressing, leaving an absolute profit of nearly 60 per cent. to the company, and had been let for three months. As to the lode in No. 2 shaft it could be easily let on tribute, but could be more profitably worked by the company itself. The vein there was 2 to 4 in. wide, solid lead.

Mr. BRIDGER asked how it was that two such valuable points had been discovered at such an early stage of the company's operations?

Capt. WILLIAMS said he found these lodes had been worked upon to some extent in different places, which convinced him that the virgin ground would be found productive. He hastened and found some very fine gossan, and the deeper they went the richer were the lodes found, which was the best evidence he could give as to his opinion being verified upon subsequent development. Even all the information he could glean the mines had not been worked for upwards of 70 years, but the waste had been dressed, showing the lodes to have been originally very productive. He should imagine the cross cut would intersect some of their most important lodes during the present year, and the cost of opening up some of the shafts would be very trifling indeed.

Colonel COMYN asked Capt. Williams not only as the manager of this mine, but from the considerable experience he had gained as the manager of West Craven Moor and Stoney Groove, whether it was his candid opinion that by the expenditure of a moderate amount of capital the West Pateley Bridge Mines would in a comparatively short time yield a fair return on the outlay?—Capt. WILLIAMS said that from the time he first saw the mines he had formed the opinion that had he the means there was no piece of ground that he would so readily develop single handed as this. (Hear, hear.)

Mr. MANSELL wished to ask, for the satisfaction of absent shareholders, whether there was any change in the formation as compared with Pateley Bridge Mines likely to interfere with the continuity or productiveness of these veins now so rich in Pateley Bridge. They all knew what these grand old mines had done, and that they had been immensely rich for many years, and that some of the most important veins were standing undeveloped in West Pateley Bridge. Under these circumstances he should like to know whether there was any change of formation likely to interfere with their productiveness.

Capt. CHARLES WILLIAMS (manager of Pateley Bridge Mines) said he held a very high opinion of the West Pateley Bridge property, inasmuch as the whole of the ground about Pateley Bridge present workings was standing whole to a height of about 56 fms., and there was no reason why similar results should not accrue therefrom, as records showed the Pateley Bridge ground had yielded riches from surface down to the water level.

The CHAIRMAN understood from that statement that the shareholders had reason to expect the virgin ground would prove as rich as it had done in Pateley Bridge Mine down to the water level.

Capt. C. WILLIAMS (of Pateley Bridge) said it certainly appeared so to him; he did not know of any reason to the contrary, and particularly as Pateley Bridge was now productive 20 fms. under the West Pateley Bridge main cross-cut. West Pateley Bridge had the same strata and the same veins, and he saw no reason at all why it should not be as rich a mine as Pateley Bridge had been down to the water level.

Mr. WOOD asked Capt. Williams if his experience of the veins in that district was that they became richer in depth?—Capt. C. WILLIAMS (of Pateley Bridge) said that it was certainly the case that as deep as they had gone in Pateley Bridge the richer were the veins, and were now 30 fathoms under West Pateley Bridge water level.











period, and they reduced mineral on an average of only 168 tons per diem. The quality of the mineral is much the same as when last noted.

The following telegrams have been received:—

May 23.—"Produce, ten days (first division of May), 12,000 oits. Yield, 7.4 oits. per ton. Profit for month (April), 9,000. All going on well."

June 6.—"Produce, 11 days (second division of May), 15,500 oits. Yield, 7.5 oits. per ton. All going on well."

June 12.—"Produce for month (May), 43,000 oits. Yield, 7.8 oits. per ton. All going on well."

**RICHMOND CONSOLIDATED.**—Cablegram from the mine at Eureka, Nevada—Hall, London: Week's run, \$42,000.

**CHICAGO (Silver).**—Cablegram from W. S. Godbe, the manager at the mine: We have run two furnaces 31 days. Net profits for May, \$31,000.

**ALMADA AND TIRITO.**—Telegram, dated Almada, May 4 (which has been detained in transmission)—Width of Mina Grande lode, 12 feet; south 15 feet—improving. The ore in the new east lode, Providencia, continues to make down wards. The ore in the new east lode, Providencia, continues to make up wards.

**BIRDSEYE CREEK.**—Telegram from the superintendent:—We have cleared up after a run of 30 days. The gross returns are \$3000; the profit is \$1750. I send you a remittance of \$2000.

**G. S. Powers, May 24:** We exploded two small blasts in Neece and west claim yesterday, the 23rd, of 50 and 20 kegs from the Brown's Hill side of the channel, which appeared to do everything desired. We shall not get the blast over main channel ready for explosion before the time mentioned in my letter of the 19th inst., and may take a day or two longer, as the gravel is so cemented that it has to be blasted with dynamite, and then a 1 ft. per day is most that can be made to the main drifting. As the washing, so far, for present month has been wholly upon side dirt, I shall not make a clean-up in this claim until I can make at least ten days more from the blast now preparing over the main channel.

**RIO TINTO.**—The company notify that the funds required to meet the coupons of the Five per Cent. Mortgage (Spanish Coupon) Bonds and of the Seven per Cent. Mortgage Bonds, due on the 1st proximo, have been deposited with Messrs. Smith, Payne, and Smiths. Coupons for payment in London must be deposited at the office of the company four clear days prior to payment, and those payable in Paris must be presented at the office of the Societe Generale.

**CEBAR CREEK (Gold and Water).**—Telegram from the superintendent:—Total product last month, including sales of water, \$11,000. Total running expenses, \$4500; Yankee and Badger not included.

**JAVALL.**—May 6: The mill worked but 12 days, owing to the Easter holidays and, as stated by the manager, to difficulties in effecting the connection between the engine and stamps: 630 tons were crushed, yielding 198 ozs., averaging 6 dwts. 7 grs.; the capital is valued at \$151; the expenditure was \$687, including 1894 on remittance account.

**CHONTALE CONSOLIDATED.**—May 6: We have crushed during the past month 627 tons of ore, from which we have obtained 147 ozs. of gold, being an average of 4½ dwts. per ton. The cost for the month has been \$31.19s. We value the gold obtained at 280s., showing a loss of 131.19s. The amount included in the above cost, and fairly chargeable to construction account, is 97.9s. Mr. Danby also states:—The small amount mined has been owing to the Easter holidays, which have stopped work for nearly half the month, and the small quantity of ore treated at Santa Domingo has been owing to want of water. During the last four months scarcely any ground has been stopped, and we have been opening out new all the time, so now we have quite a little reserve of payable ground; this we will have to fall back upon when the wet season sets in, and with improved and additional machinery I think I can safely promise good returns. The health of the establishment is good.

**SAN PEDRO (Chili).**—Wm. Phillips, May 3: The 150 is without change. We shall begin to prepare for sinking the shaft next week, as I consider this the great point of interest. The 150 is without change since last report. The 110 and 120, drifting round the mine, by two men, is still producing good stones of native copper, but is not improved. The stone in the back and bottom of the 88 will average 7 tons of 22 per cent. ore per fathom. The chiflon sinking at the side of manto will produce 5 tons of 22 per cent. ore per fathom. In the 47 the cross cut driving towards the Cuba is without change; ground easy for driving. Cuba Mine is without change. The engine and everything about the mine, underground and at surface, is going on satisfactorily.

**EXCHERQUER (Gold and Silver).**—L. Chalmers, May 22: I wrote you on the 15th after my return from Potosi. I am busy getting things settled in so as to get timber saved for the mine for the season, and the lumber I shall require for the furnace buildings, new flume, &c. The engine-shaft is now down 356 ft. The north drift from the 20 is in 434½, in fine quartz and clay mixed. I had four men timbering at the 300, two men drifting at the 200, and three men extending the car tramway. The winze at the 140 is again all ready for stopping. The 300 will be ready this week, so also the 200. I have let a contract to cut 800 cords of wood at the mine at \$2.25 per cord at the stump. It will cost me \$2 more to get it to the hoisting works. Herbert Lindsay let a car fall down the shaft to the 300 last week. He was paid off.

**MALABAR.**—G. V. O'Reilly, April 30: The Mine: Our work throughout the hard rock is now very nearly finished, and immediately after our clean up we shall concentrate all our efforts on reaching the high ground to the east, which, as the board is aware, is the only point of promise now before us. It was our intention to have made a complete clean up in time to remit by this mail, but as our blasting operations have so much impeded washing during the last three months Mr. Anderson and myself have determined to defer the clean up until next month, in order to run in one of the bottom ground, which has no become easily accessible. Our total running time up to date—from the middle of January to April 30, has only been 270 hours, but during the next fortnight we hope to get in 100 hours on the bottom ground, so that our best policy is certainly to defer for a few days longer taking up the blocks, and thus largely augment the result. In the meantime there is really little to notice in the present work, as all our labour has been directed to opening our outlet through the rock, and thus rendering further exploration possible. The banks we are now aiming for inspire us with fair hopes of good results, but, of course, we can only speculate as yet as to their richness; what little we are enabled to get to confirm us in the opinion we have formed that the best part of the mine lies in this direction.

**PANTULILLO COPPER.**—F. G. Welch, May 2: The mine from the 60 metre level south is now communicated to the 85 metre level. This is the completion of one step towards opening out a new slope from the 61 metre level south. When the new skip road is finished to the 85 metre level we shall then be able to draw also from the Romana shaft, the old Pique Isabel horse-whim having been removed and fixed up for this purpose. In about another month I anticipate everything will be ready. Cerro Negro: Work by perquin tributors is still continued with good results. Production of date about 3000 cwt. per month. The 120 south yields 1½ ton of 12 per cent. ore per fathom. The 120 north yields 1½ ton of 12 per cent. ore per fathom. To end of past month we produced about 42,000 quintals metric, at 5½ per cent. For the present month I anticipate a like proportional production.

**PONTGIBAUD.**—W. P. Rickard, June 1: Ronre: The sinking of the engine-shaft below the 125 oits on a little better; the rock, although still hard, is more advantageous. The 50 metre level north is being driven by the side of the lode which yields 1½ ton of 12 per cent. ore per fathom. The same level south opens good ground, worth 1½ ton of 12 per cent. ore per fathom. The 60 north yields 1½ ton of 12 per cent. ore per fathom. The 60 north is unproductive. The 50 north of the shaft, is poor; the winze behind this and yield-saving work. The adit north has been holed to the same level south from mill shaft, opening tribute ground for a good length, worth from 1½ to 1½ ton per current metre. The slopes and tributaries throughout this mine continue to yield fair quantities of ore. Mische: The clearing and repairing of the adit north has been continued; it is very badly crushed. The intermediate level north has yielded some pretty good ore off during the month, but the lode is at present disordered by slide ground. A stop behind the end of the 125, 1½ ton of 12 per cent. ore per fathom. The 140, south of Basso's shaft, yields 1½ ton of 12 per cent. ore per fathom. The 120 south yields 1½ ton of 12 per cent. ore per fathom. In the 160 south the lode has been discovered by slide ground, and has become poor. The winze behind this is opening good ground, worth 1½ ton per current metre. The 50 south continues poor; we have had the lode opened to its full width, which is four metres, and it composed of decomposed gneiss, clay and stones of quartz, and carbonate of lime. The side level in the 60 proceeds well. The rise in the back of the 90 is unproductive. Prun 1: We have set St. George's shaft to sink below the 90; the ground is hard and spruce. The 90 south yields 1½ ton of 12 per cent. ore per fathom. The 70 north yields 1½ ton of 12 per cent. ore per fathom. The same level north yields stones of blende and pyrites, but no silver-lead ore to value. The 50 north yields a little saving work, but the same level, on Henri's lode is unproductive. The 30 south is poor. Surface: All one dressing operations have gone on regularly, and the samplings have amounted to 277 tons.

**LUSTIANIAN.**—June 6: Pailhal: At Taylor's engine shaft the lode below the 190 is from 6 to 7 ft. wide, composed of quartz. The 110 cross-cut is being continued south of Bisto's lode, east of River shaft; the ground is a hard gneiss, and we have no indication of any ore outcrop. In the winze No. 190, below the 150 ft. west of Taylor's shaft, the lode is worth 4 tons per fathom for the length of the winze—9 feet. In winze No. 101, below the 160 west, the lode is producing 1½ ton of copper ore per fathom. In rise No. 102, above the 130, east of River shaft, the lode is 4 ft. wide, composed of quartz and stones of ore. Levels on Bisto's lode: In the 190, west of Taylor's, the lode has much fallen off, now worth about 1 ton per fathom. In the 170, west of the slide, the lode is 6 ft. wide, worth 1½ ton per fathom; and in the 150, 4 ft. wide, worth 1½ ton per fathom; this end is also much fallen off in the 130, east of the slide, the lode is 1 ft. wide, composed of quartz and stones of mica; in the 70, east of the slide, the lode is also 1 ft. wide, and is composed of good-looking quartz and good stones of lead. The lode in the 50, east of the same, is 2 ft. wide, composed of quartz and country. The 70, west of the slide, has been surrendered; the lode is small and poor. The lode in the 28, east of River shaft, is in two parts, the north one poor, and the south one giving small but good stones of ore. The 70, east of River shaft, on Mill lode, is suspended, the lode being small and unproductive. Cressida: The lode in the 60, west of the cross cut, is nearly 1 ft. wide, composed of quartz. The 50 is now being extended west of the incline shaft, on a north and south lode, which is 1 ft. wide, made up of quartz, mica, spots of lead, and stones of blende.

**PESTARENA.**—T. Roberts, June 7: District Lead Topps: At Zero level the third cross-cut westward advanced, in May, 3 m. 40 c., and is set to five men for June at 100 ft. per metre. Of the small branch of ore cut through by this cross cut last month we have made a second trial with the small mill, which gave the rate of 1 oz. 5 dwts. of sponge gold per ton. The intermediate level below Zero, going south on the winze, was driven 1 m. 80 c.; and set to five men for June, at 200 ft. per metre; lode yielding 10 tons per fathom, worth about 15 dwts. of gold per ton. The new slope in the bottom, behind this end, yields 15 tons per fathom, of 10 dwts. per ton, and is being worked by five men at 25 ft. per metre. The end north of winze, under this level, was extended in May 1 m. 40 c.; the lode producing 3 tons per fathom at 9 dwts. per ton; this end is suspended for the present month—Great Quartz lode: In the north end of ground, above No. 2 level, 2½ m. was driven; lode producing 12 tons per fathom, at about 4 dwts. per ton; set to five men for June, at 120 ft. per metre. The new rise behind this end was put up 2 metres, and is set to two men, at 120 ft. per metre; the lode producing 12 tons per fathom, at about 8 dwts. per ton. In the slopes under No. 2 level on this lode, south of winze, we have commenced a drive by five men, at 10 ft. per metre; the lode produces 8 tons per fathom, with 8 dwts. per ton. The slopes in bottom of No. 2, south of fourth cross cut, on the new lode and branches, yield 10 tons per fathom at 10 dwts. per ton. The end south of fourth cross cut, on the lode or branch east of new lode, was driven last month 1 m. 40 c.; set to two men for June, at 10 ft. per metre; lode yielding 2 tons per fathom at 8 dwts. per ton. The No. 3 level south, on Great Quartz lode, was driven 35 m. only; the lode here is 18 in. wide, carrying spots and strings of pyrites. District Pestarena: The lode in the incline shaft

maintains its size, and all other points in operation throughout the mine continue much the same as for some time past. On surface fair work is being done towards the erection of the six additional mills, and we hope to be able to start them amalgamating about the end of the present month.

**BENSBURG.**—C. Oraz, June 12: Victoria Shaft: I exceedingly regret that up to the present we have not been able to drain the bottom of this shaft. We have now about 15 ft. of water here, and we are now engaged sinking another 7½-in. drawing lift by the side of the plunger. This we hope to set to work some time to-day. We shall then have two drawing lifts under the 14, and the plunger and drawing-lift from there to surface, and these I have every confidence will enable us to drain the shaft in a few days. We were not able to supply the high pressure pump with steam in addition to our engine, hence our being obliged to dispense with it. We are putting forth every energy and making every effort to get to the bottom of the shaft, as I am very anxious to see more of the lode at the 22, especially as we have in addition to the good stones of ore splendid indications in the lode itself, such a large quantity of water coming from it. To my mind the fact that we have here so strong water, and you had just over the point where the water is issuing a bunch of carbonate, are grand evidences of large bodies of ore underneath, and from the rich stones of ore we broke out of the bottom of shaft, with the very hole which opened up such a feed of water, strengthen my opinion that there is a good mine here can we but overcome the present difficulty with the water. The 14 west of this shaft has been driven in all about 26 fms., and for the whole distance we have had a lode containing ore more or less, while a great many places, 12 and 13 tons of ore per fathom, especially in the bottom of the level. There is now in place a lode from 3 to 10 ft. wide, which if the 22 were driven up under the ground laid open for stopping would pay well. The lode in the present end is a little disordered by a crossing, but it still contains lead ore, and I have no doubt it will again improve in driving west. The 14 has been driven in all 27 fms. to the east of this shaft. This end also has gone through some very promising ground, and the last 2 fms. produced some good ore, which we shall be able to sell in the stone without putting it through the dressing works. The indications here are quite equal to the western ground, and altogether for the whole extent driven over 50 fms.) gives evidences of a strong productive lode in depth. In conclusion, I may add that I believe could we once drain the bottom of the shaft, and keep it so for a few days, we should then have less trouble with it, and could burn less coals, while our men would make good progress in getting to the richer part of the lode at the 22. The engine and pumps are in first-rate condition, and working well.

## THE INDUSTRIAL USES OF ALUMINIUM.

It is now about 20 years since the celebrated French chemist, Deville, succeeded in demonstrating the possibility of producing the metal aluminium upon the large scale; but up to the present the extent to which this interesting and praiseworthy invention has been utilised has but to a slight degree realised the sanguine expectations which intelligent minds of all professions have been accustomed to associate with it. So important, indeed, were the fruits of Deville's first investigation deemed to be that they were at once invested with the dignity of royal patronage, and the first works for the manufacture of the new metal were shortly thereafter erected at Javelle, near Paris, from the private purse of the late Emperor of the French. It was expected that the new product would at once find its way into the useful arts as an effective and valuable substitute for many other metals. That these expectations were well founded will be apparent from the characteristic and very exceptional properties of the metal. A bright pure surface of aluminium possesses a greyish-white colour, something between that of zinc and tin. Its extreme lightness is one of its very distinguishing properties, and affords an immediate means of identifying it from every other metal. Its specific gravity is but 2.5 (water=1), from which it appears that it is about three times lighter than copper, four times lighter than silver, and nearly eight times lighter than steel. It is, in fact, the lightest of all metals, and is only surpassed by the gas of hydrogen, which is lighter than air.

It is not only light, but it is also very strong. Its tensile strength is equal to that of iron, and its resistance to compression is equal to that of steel. It is, in fact, one of the strongest of all metals, and is only surpassed by steel and iron. It is also very ductile, and can be drawn into wire, or rolled into sheets, of any thickness. It is also very malleable, and can be hammered into any shape. It is also very resistant to corrosion, and is not affected by most acids and alkalis. It is also very resistant to heat, and is not melted by the heat of the sun or of a fire. It is also very resistant to cold, and is not frozen by the cold of the sun or of a fire. It is also very resistant to electricity, and is not affected by the electric current. It is also very resistant to magnetism, and is not affected by the magnetic force. It is also very resistant to light, and is not affected by the light of the sun or of a fire. 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It is also very resistant to playing, and is not affected by the playing of the sun or of a fire. It is also very resistant to working, and is not affected by the working of the sun or of a fire. It is also very resistant to resting, and is not affected by the resting



# BLAKE'S PATENT STEAM PUMP.

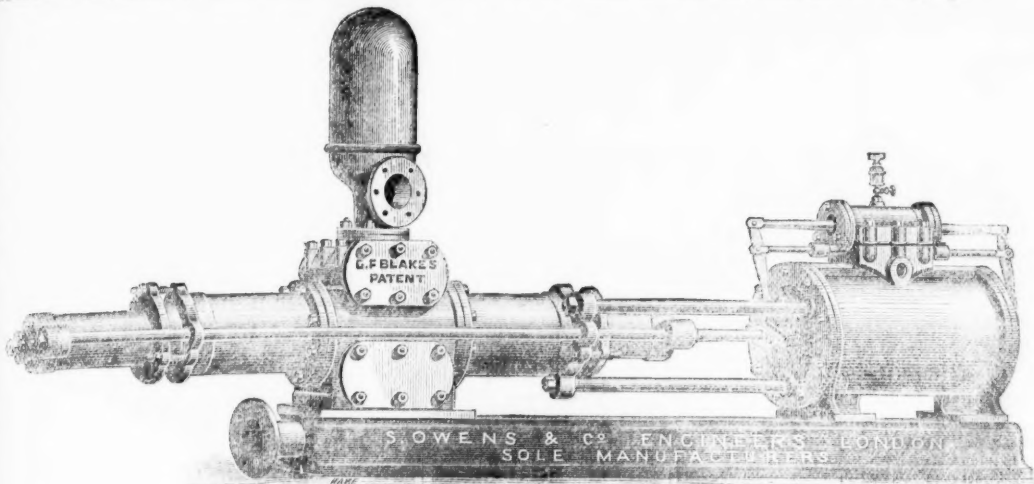
MORE THAN 8000 IN USE.

SOLE MAKERS FOR GREAT BRITAIN,

## S. OWENS & CO.,

Hydraulic and General Engineers, Whitefriars-street, London;  
And at 195, Buchanan-street, Glasgow (W. HUME, AGENT).

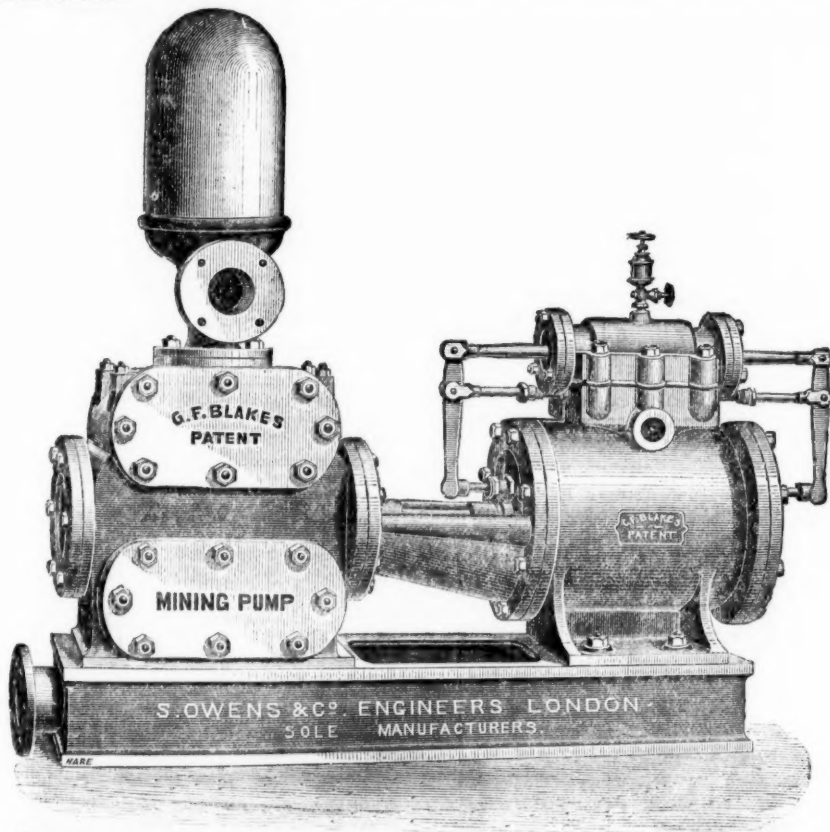
These PUMPS from their SIMPLICITY, RELIABILITY, DURABILITY, and ECONOMY are SPECIALLY SUITED FOR MINING PURPOSES, where large quantities of water require to be raised from great or medium depths with CERTAINTY. They are double-action in their construction, throwing a constant stream of water, can be made of any stroke to suit the space in which they have to work, can be arranged with any combination of steam and water cylinders to suit the pressure and lift against which it is desired to work them, are made of the very best materials and highest class of workmanship, and all working parts can be readily got at by any ordinary workman, and replaced if necessary by a duplicate part (all such being interchangeable) in the shortest possible time. For situations where gritty and sandy water has to be pumped the DOUBLE PLUNGER PATTERN is recommended. Where space is limited the PISTON PUMP is better suited, a novel feature of which is the PATENT REMOVEABLE LINING, which can be removed in a few minutes and substituted with a new one, without disturbing any other part of the pump.



Blake's Improved Double-plunger Steam Pump.

S. OWENS AND CO.,

In placing the BLAKE STEAM PUMP before the mining world, believe they are offering the BEST, MOST RELIABLE, and ECONOMICAL PUMP that has yet been made, and solicit an inspection of various sizes in operation at their works, Whitefriars-street, Fleet-street, London.



Blake's Improved Mining Pump, with Patent Removeable Lining to Pump Cylinder,

Any combination of these Pumps may be had to suit circumstances. The following are some of the SIZES SUITABLE FOR MINING PURPOSES:—

	12	12	12	12	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	24	24
Dia. of steam cylinders, in.	12	12	12	12	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	24	24
Dia. of water cylinders, in.	3	4	5	6	4	5	6	4	5	6	8	4	5	6	8	5	7	8	9	6	8
Length of stroke, in.	18	18	18	24	24	24	24	24	24	24	24	24	30	30	30	30	30	36	36	36	42
No. of strokes per minute.	30	30	30	30	25	25	25	22	22	22	22	22	22	22	22	20	20	17	17	17	15
Quantity in gallons per hour, approximately	1440	2610	4200	5940	2910	4620	6600	2646	4158	5940	10620	2646	5160	7500	13260	4586	9000	12360	15660	6720	20

PRICES FOR THE ABOVE, OR ANY SPECIAL SIZE, AND ILLUSTRATED CATALOGUES FURNISHED ON APPLICATION.

### PATENT CONDENSORS

Can be supplied for any size pump to effect a saving of fully 30 per cent. in the consumption of fuel, greatly increasing their efficiency

The Blake Pump will work under water, and as efficiently with compressed air as with steam.

BLAKE'S DONKEY PUMPS FOR FEEDING BOILERS KEPT IN STOCK.

### DETONATORS,

BEST QUALITY, AND ANY REQUIRED STRENGTH,  
FOR EXPLODING  
DYNAMITE, LITHOFRACTEUR, GUN COTTON, &c.  
FOR SALE.

JONES, SCOTT, & CO.,

22, BASINGHALL STREET, LONDON.

MINERS

PRICKERS AND STEMMERS

MUNTZ'S METAL.

ACCORDING TO THE NEW MINES REGULATION ACT.  
BEST KNOWN MATERIAL.

MUNTZ'S METAL COMPANY (LIMITED),

FRENCH WALLS,

NEAR BIRMINGHAM

### SOLID DRAWN BRASS BOILER TUBES

FOR LOCOMOTIVE AND MARINE BOILERS,

EITHER

MUNTZ'S OR GREEN'S PROCESS

MUNTZ'S METAL COMPANY (LIMITED),

FRENCH WALLS,

NEAR BIRMINGHAM.

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GAUZE MANUFACTORY,

Established Half-a-century.

JOSH. COOKE AND CO.

SAFETY LAMPS

MADE TO DRAWING, DESCRIPTION, or MODEL. Illustrated

Price Lists free, by post or otherwise.

VALUABLE TESTIMONIALS FROM EMINENT FIRMS.

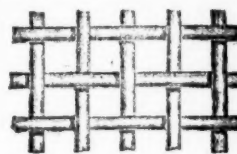
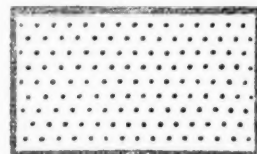
MIDLAND DAVY LAMP WORKS,

DELMONT PASSAGE, LAWLEY STREET,

BIRMINGHAM.

Specimens may be seen at the PHILADELPHIA EXHIBITION.

STRONG WIREWORK.



STRONG WIREWORK, the cross wires equally bent; also BEST STAMP GRATES, both of iron and copper, and punched copper plates.

DITTO TUBBED. All the above promptly supplied at  
W. ESCOTT'S MINING MATERIAL DEPOT,  
TAVISTOCK, DEVON.

FOREIGN ORDERS PROMPTLY EXECUTED.

WILTON'S MATHEMATICAL INSTRUMENT ESTABLISHMENT,  
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W. H. WILTON begs to thank his friends for their liberal support for so many years, and informs them that (having opened business at Valparaiso) he has now declined business in England in favour solely of Mr. A. JEFFERY, MATHEMATICAL INSTRUMENT MAKER, CAMBORNE, whom he considers (having been an assistant to his father for several years) is in every way capable of creditably maintaining the good name universally awarded to Wilton's instruments.

A. JEFFERY

Respectfully begs to inform Mine Managers, Surveyors, Engineers, &c., the having purchased Mr. Wilton's business, and the very valuable acquisitions and appliances belonging thereto, he has enlarged his Mathematical Instrument Manufactory, and is prepared to supply THEODOLITES, DIALS, POCKET DIALS, LEVELS, TRAVELLING AND PLAIN PROTRACTORS, CASES OF DRAWING INSTRUMENTS, MEASURING CHAINS AND TAPES, ASSAYERS' SCALES AND WEIGHTS, ENGINE COUNTERS, and, in short, every description of Instruments used in SURVEYING, MEASURING, MAPPING, &c.

Repairing in all its branches promptly attended to.

### ONE MILLION STERLING

Has been paid as COMPENSATION FOR DEATH AND INJURIES

Caused by

ACCIDENTS OF ALL KINDS,

By the

RAILWAY PASSENGERS' ASSURANCE COMPANY.

HON. A. KINNAIRD, M.P., Chairman.

PAID-UP CAPITAL AND RESERVE FUND £180,000.

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Bonus allowed to Insurers on Five Years' standing.

Apply to the Clerks at the Railway Stations, the Local Agents, or—  
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WILLIAM J. VIAN, Secretary.

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CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

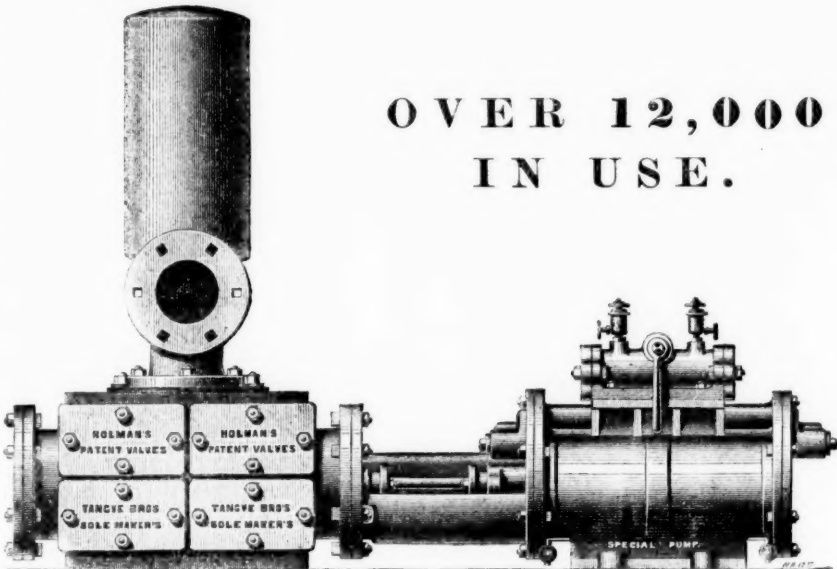
# TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.,

AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO, FOR

## "THE SPECIAL" DIRECT-ACTING STEAM PUMP.

After eight years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once the simplest and most certain in action. There is absolutely no extraneous gear, and the steam cylinder is no longer than the pump. The valves are of easy access, and are suited for pumping fluids and semi-fluids of almost any consistency.



OVER 12,000 IN USE.

WILLIAM ELLIOT, Esq., of the Wardale Iron and Coal Company, writes under date Sept. 17th, 1875, as follows:—"We have now THIRTY-FIVE of your SPECIAL STEAM PUMPS in operation at the various collieries under my charge—some of them employed pumping water out of our pits to the depth of 50 fms.—others employed in the pits, and a good many feeding Boilers. I have no hesitation in saying that we have found them the Cheapest and Best Pumps of the kind we have tried. I can with confidence recommend them to intending purchasers."

Messrs. BURT, BOULTON, and HAYWOOD, Chemical Manufacturers, of London, have also THIRTY-EIGHT of the "SPECIAL" STEAM PUMPS in use at their works, and continue to order more.

## GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

Diameter of Steam Cylinder...In.	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10
Diameter of Water Cylinder...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6
Length of Stroke.....In.	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	12	12	12	18	24	12	12
Gallons per hour .....	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,519	5070	7330
Price .....	£ 16	18	20	25	22 10	27 10	32 10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70	85	55	60

CONTINUED.

Diameter of Steam Cylinder..In.	10	10	10	10	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	16	16	18	18	18	18
Diameter of Water Cylinder..In.	7	8	9	10	6	7	8	9	10	12	7	8	9	10	12	14	8	9	10	12	14	9	10	12	14	10	12
Length of Stroke.....In.	12	18	24	24	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour .....	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000	20,000	30,000
Price .....	£ 55	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	140	150	160	180	200	180	190	200	220	230	240

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of automatic delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

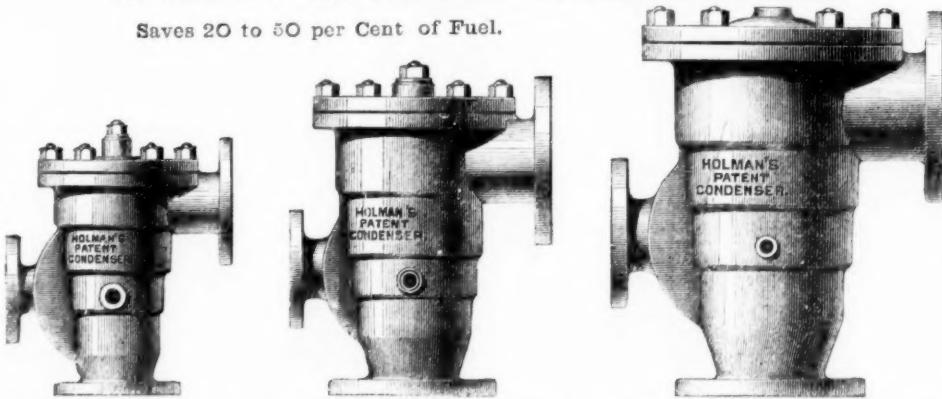
**The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.**  
HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36 48 and 72-inch Strokes.

## Holman's Patent Self-acting Exhaust Steam Condensers,

FOR ALL KINDS OF STEAM PUMPS AND HIGH-PRESSURE STEAM ENGINES.

- TURNS WASTE STEAM INTO GREAT POWER.
- REQUIRES NO THREE-WAY COCKS, CHECK, OR REGULATING VALVES.
- SAVES HALF ITS COST IN PIPES AND CONNECTIONS.
- PREVENTS ALL ESCAPE OF STEAM IN MINES OR ELSEWHERE.
- REQUIRES NO EXTRA SPACE.

Saves 20 to 50 per Cent of Fuel.



These Condensers are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam, they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine, and effecting a saving in fuel of from 20 to 50 per cent. In Mining operations these Condensers will be of great value. All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:—

MORLEY COLLIERY, WIGAN, October 16th, 1874.  
Messrs. TANGYE BROTHERS AND HOLMAN.  
GENTLEMEN,—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the strict economic sense, a most valuable feature in the drainage of underground work.

The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (168 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 84 strokes (168 feet) per minute, the steam gauge

indicating a steam pressure of 36 lbs. per square inch, 50 yards from the Pump, and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time. (Signed) J. THOMPSON.

Price from 30s. to 40s. per inch diameter of Steam Cylinder, according to the relative Diameter of Pump for which Condenser is required.

NORTH OF ENGLAND HOUSE ... TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.  
SOUTH WALES HOUSE... TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.



# PATENT IMPROVED ORE WASHING & DRESSING MACHINES.

## THE SANDYCROFT FOUNDRY & ENGINE WORKS CO. (LIMITED), NEAR CHESTER

LATE THE MOLD FOUNDRY CO. (ESTABLISHED 1838).

SOLE MAKERS IN GREAT BRITAIN.

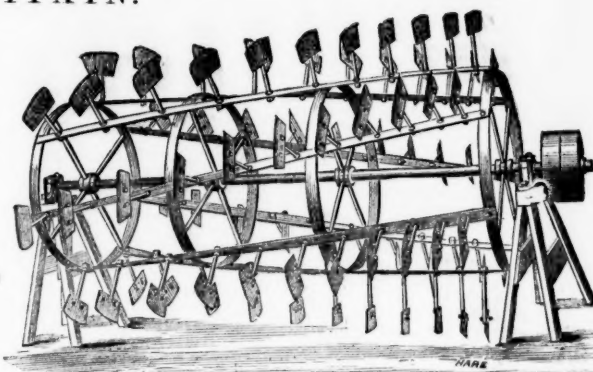
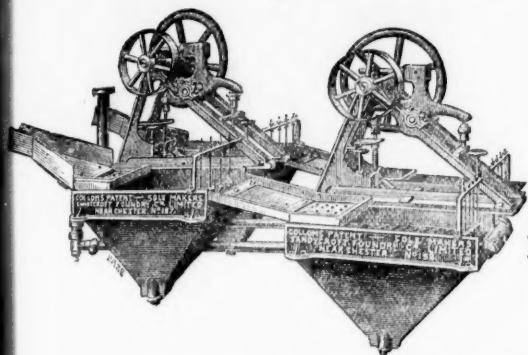
HUNDREDS IN USE.

FULL PARTICULARS,  
PHOTOGRAPHS, TESTIMONIALS, AND PRICES,  
UPON APPLICATION.Will supply Designs, and all the necessary Plant for laying out  
Dressing Floors; also

MANUFACTURERS OF EVERY VARIETY OF

**MINING MACHINERY**

PUMPING &amp; WINDING ENGINES,

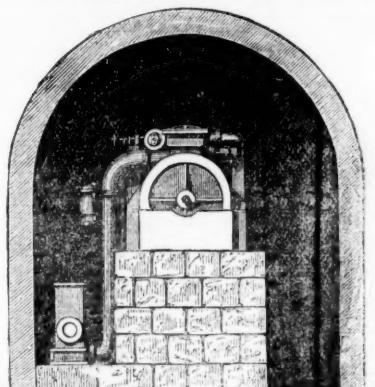
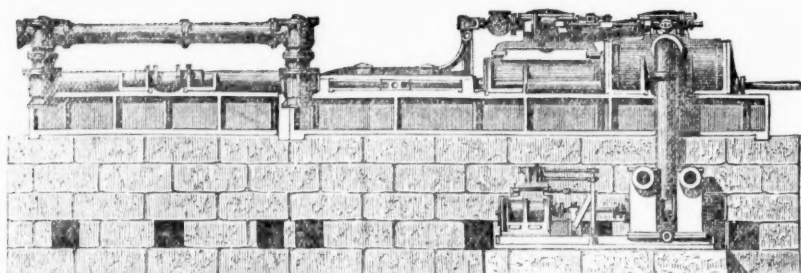
PITWORK, CRUSHING MILLS,  
ROLLSOF PECULIARLY HARD AND TOUGH MIXTURE  
&c., &c.COLLON'S PATENT AUTOMATIC ORE WASHING MACHINE, working at the following and  
many other Lead, Copper, Blende and Tin Mines:—Great L. Key, C. pe Copper, Pontgibaud, Linares, Ala-  
millos, West Tolgus, Lisburne, Minera Halvans, Snailbeac', &c.; and also at Messrs. Vivian and Sons'  
Works, Swansea.PATENT IMPELLER, OR KNIFE BUDDLE, in use at the following and many other Lead,  
Copper, Blende, and Tin Mines:—The Van, Roman Gravels, Tankerville, Ladywell, Lisburne, East  
Black Craig, Old Treburgett, Penhale & Barton, Bog, Linares, Fortuna, Alamillos, Minera Halvans, &c.

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## HATHORN, DAVIS, CAMPBELL, AND DAVEY,

MAKERS OF

The Differential Pumping Engine, Hydraulic Pumping Engines, Cornish Engines, Differential  
Blowing Engines, Compound Rotative Engines, the Separate Condenser, Hydraulic Machinery,  
Mining Plant of all kinds, and Machinery for Water Supply, Irrigation, &c.



THE COMPOUND DIFFERENTIAL ENGINE AND FORCE PUMPS,

With Separate Condenser, as applied Underground, forcing 700 gallons per minute 920 feet high.

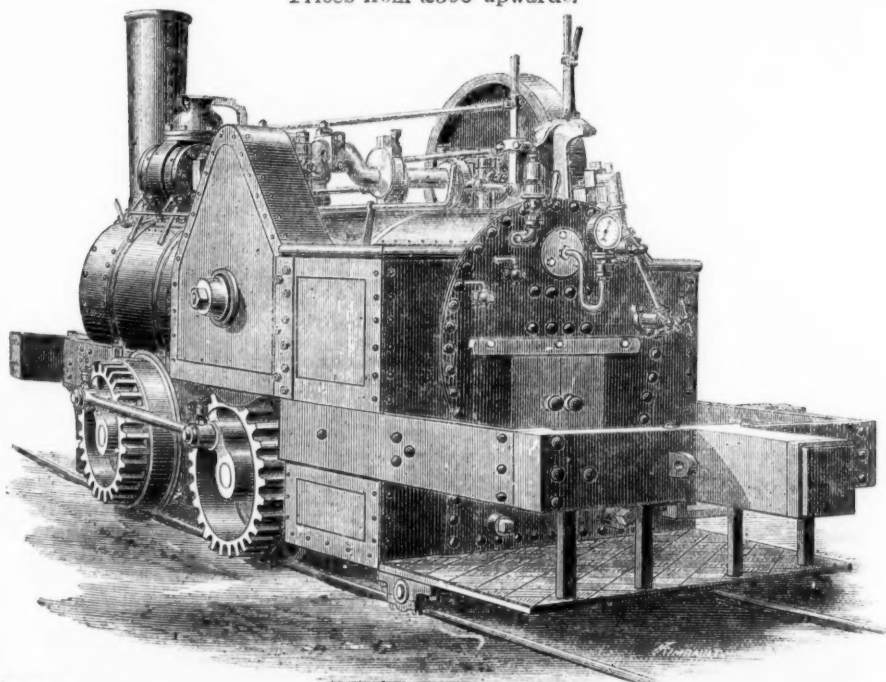
**SUN FOUNDRY, LEEDS.**

FURTHER PARTICULARS ON APPLICATION

## LEWIN, POOLE, DORSET.

Speciality in cheap colliery and contractors' Locomotives, and  
very small Locomotives for replacing Horses.

Prices from £300 upwards.



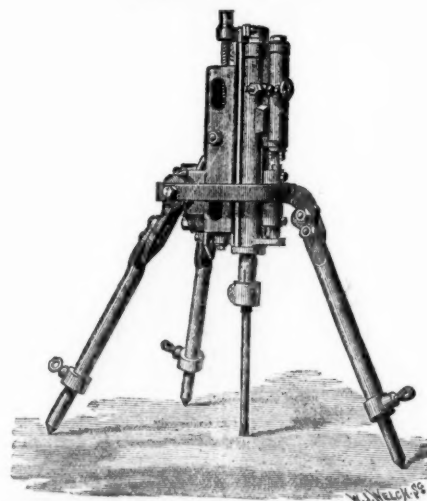
**PORTABLE FIXED AND VERTICAL ENGINES.**  
**WINDING AND PUMPING GEAR.**

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For Tunnels, Mines, Quarries,

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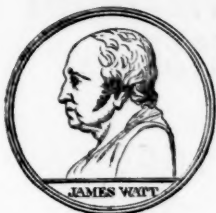
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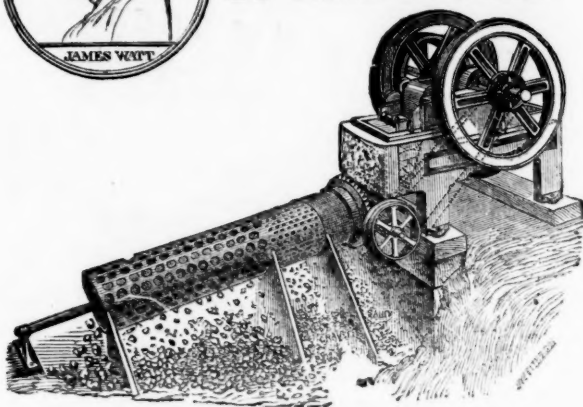
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BUYERS are CAUTIONED against Purchasing any Infringements of H.R.M.'s Numerous PATENTS.



Ore Crushers, H. R. M.'s  
New Patent Crushing Jaw  
EXTENSIVELY USED  
BY MINE OWNERS.



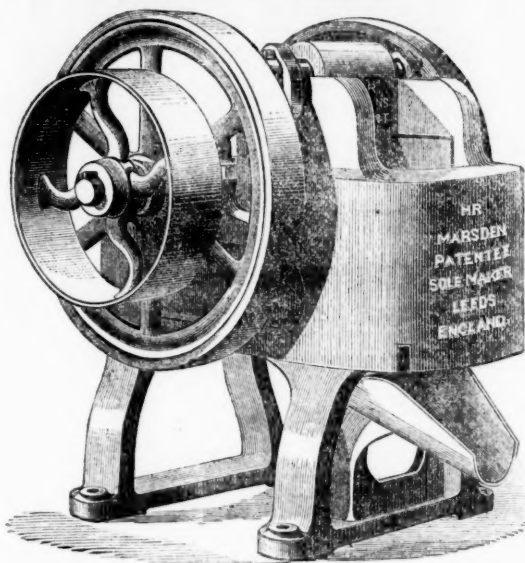
FIXED MACHINE AND SCREEN,

Specially designed and largely used for  
Crushing Pyrites, Limestone, Cement, Coal, Rocks, &c.,  
AT ALL THE PRINCIPAL WORKS IN THE KINGDOM.  
Takes in 20 in. by 9 in., and is shown by TESTIMONIALS to be  
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FEW WORKING PARTS.  
SMALL WEAR AND TEAR.  
FREEDOM FROM BREAKAGE.

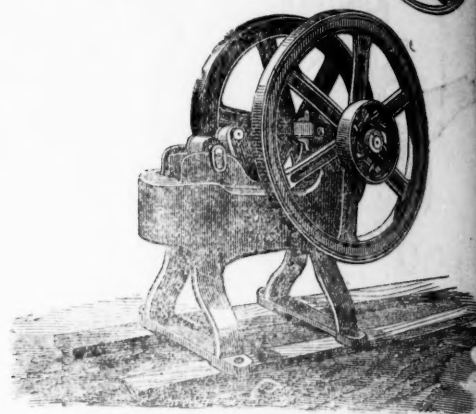
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"The Machine is well designed, simple, but substantially made,  
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per ore, and is certainly preferable to the stamps in use for that  
purpose."—Mining Journal.



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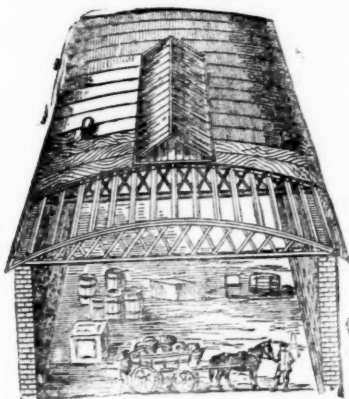
REFERENCES TO ALL PARTS OF THE WORLD,  
SIMPLICITY OF CONSTRUCTION. EXCELLENCE OF SAMPLE  
ECONOMY OF POWER.

THESE STONE BREAKERS AND ORE CRUSHERS ARE UNIVERSALLY PRONOUNCED THE ONLY PERFECT SUCCESS.

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**Sole Maker & Patentee, H. R. MARSDEN, SOHO FOUNDRY, LEEDS, ENGLAND.**

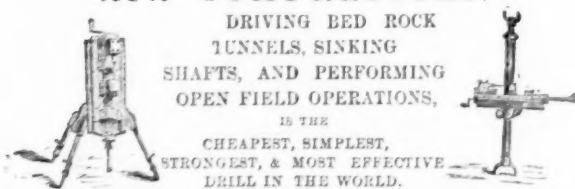
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FELT ROOFING,**



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GREAT ECONOMY  
AND  
CLEAR WIDE SPACE.  
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and plans, address,—  
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ST. BENET CHAMBERS,  
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MANCHESTER;  
OR  
CORPORATION STREET,  
BELFAST.

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of which are double bow and string girders of best pine timber, sheathed with 1/2 in.  
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both in the cost of roof and uprights.  
They can be made with or without top-lights, ventilators, &c. Felt roofs of any  
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Wholesale buyers and exporters allowed liberal discounts.  
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AND  
AIR COMPRESSORS.**



DRIVING BED ROCK  
TUNNELS, SINKING  
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OPEN FIELD OPERATIONS,  
IS THE  
CHEAPEST, SIMPLEST,  
STRONGEST, & MOST EFFECTIVE  
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OFFICE,—193, GOSWELL ROAD  
(W. W. DUNN AND CO.,  
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By a special method of preparation, this leather is made solid, perfectly close in  
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tial for pump buckets, and is the most durable material of which they can be made.  
It may be had of all dealers in leather, and of—

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Prize Medals, 1851, 1855, 1862, for  
MILL BANDS, ROSE, AND LEATHER FOR MACHINERY PURPOSES.

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W. and S. FIRTH undertake to CUT, economically, the hardest  
CANNEL, ANTHRACITE, SHALE, or ORDINARY COAL, ANY  
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Prevents radiation, saves from 20 to 25 per cent. of fuel, keeps  
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